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THE PRACTICAL TEACHER

IN THE ANCIENT CITY OF YORK.

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A MONTHLY MAGAZINE AND REVIEW

FOR THE SCHOOL-ROOM AND THE STUDY

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EASTER AT YORK.

THE THIRTY-FIRST ANNUAL CONFERENCE OF THE N.U.T.

Monday.

ALTHOUGH Conference representatives began to foregather in York on Good Friday, the first serious item in the programme was the special service in the Cathedral, which the Dean kindly arranged for, and which was so well attended that the choir barely contained the teacher congregation. The offertory, amounting to upwards of £8, was, as a special compliment, as well as by way of a little help, given to the charities of the Union. There was no sermon, and for the rest, the service, with this single exception, was the usual morning service of the Church of England.

Leaving the Minster at 11.45, there was but little time to get lunch and secure a seat by one o'clock in the Jubilee Concert Room, better known for the nonce as the Conference Chamber.

Punctually at 1 p.m. the Lord Mayor, followed by the Sheriff, the Bishop of Beverley, the Dean of York, the senior Member of Parliament for York, the Member for Kimbolton, and the officials and executive of the N.U.T., took the chair, and heartily welcomed the assembled teachers to the ancient city of York. His lordship spoke in a happy vein, his best hit being a reference to a schoolmaster of his acquaintance, who explained the success of his scholars by saying that he was in the habit of

"Putting it into them whether or no"—

his lordship very acutely remarking that it was one thing to have scholarship and another to have the teacher's ability to "put it into them."

The Sheriff followed with an equally warm welcome, and with a special reference, as a manufacturer, to the service that was being done to British trade by technical education.

The Dean of York was remarkably bright and commendably brief in his remarks, the substance of which was welcome and Godspeed. The warmth of the welcome was very wittily put by making use of the old Irishwoman's remark anent the welcome to the Queen, "which," said she, "was nothing to the welcome that would be given to Her Majesty when she left the country." Representatives not only appreciated the joke, but they also realised the real heartiness that the Dean so happily voiced.

Mr. Butcher, the senior M.P. for York, was so favourably impressed with the assembly that he wished himself at school again, if only as a half-timer; an expression which Mr. Waddington made very happy use of later on.

The Bishop of Beverley bore testimony to the excellent work done by the rural teacher, and referred to a motion on the agenda which aimed at the extinction of the voluntary subscriber, in terms of regret and even of chagrin.

The Chairman of the School Board, the Rev. G. E. Cutting (on behalf of the Nonconformists), Mr. Grant Lawson, M.P., and Mr. Howard, H.M.I., all had some hearty words of welcome for the representatives; and then the retiring president, Mr. Clancy, followed by Mr. Waddington, whose bright little speech was one of the happiest that we have ever listened to, thanked the speakers for the heartiness of the welcome; and upon the withdrawal of the civic and ecclesiastical dignitaries, Conference was opened. After the appointment of scrutineers, the installation of President Jackman, and votes of thanks (by acclamation to ex-President Clancy), we entered upon the

PRESIDENT'S ADDRESS.

Mr. Marshall Jackman first came to the front as a teacher's champion in connection with the Wimblington case, where a master was unjustly persecuted because, forsooth, he presumed to take an independent line of action in a parliamentary election. Right yeomanly did the president, in these early days, fight the Wimblington battle. What can be more fitting than that the champion, having become president, should address Conference on Tenure? Of

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PRACTICAL TEACHER'S ART MONTHLY.

course the vital necessity for making security of tenure a reality, if Superannuation is to become anything but a farce, was insisted upon. The tragic side of the question

J. H. YOXALL, M.P.

ERNEST GRAY, M.P.

was illustrated by referring to the sad death of poor Mortimer of Birkdale, and to the more tragic suicide of the wife of a teacher whose

Pathetic Letter,

as given by the president, we print below :—

> "Never lived a better man—truly a martyr. How shockingly treated.....and now I am a hindrance. Go on the N.U.T. for three months and rest. Father, be good to my boys. Dear mamma, see Fred through. You were *both* good when I was at home. Poor Eric is neglected; I cannot help it. I only muddle on. God forgive me."

Even more strongly did the verdict of public opinion show the justice of the president's claim for reasonable security of tenure. The Roman Catholic Hierarchy, the National Society, the Wesleyan and Jewish governing bodies were quoted as having admitted the principle, although their way of giving due effect to it does not commend itself to Mr. Jackman. Coming to individuals, the president quoted Mr. Acland and Sir John Gorst as having voiced the teachers' just demands in this connection, and then very cleverly led us to see that

Tenure is a just corollary to Superannuation.

Mr. Jackman did not content himself with looking only to England. He has studied the various educational systems of continental Europe and of the Colonies, and he had no difficulty in showing that England is far behind other countries in granting a just meed of security to her teachers in respect to their posts.

Some Typical Cases.

By far the most convincing part of Mr. Jackman's eloquent address was the giving of chapter and verse for the cry that tenure is insecure. We print *in extenso* the cases quoted, concerning which how truly may the hackneyed remark be made that "comment is needless" :—

Reduction of Salary to pay for Roof of Church.

"A master after sixteen years' service was asked to sign a new agreement. The new conditions meant a loss of £20 a year in salary. At first the vicar denied there was any reduction. When it was proved to him beyond all chances of denial, he admitted the allegation. He said he wanted the money to pay for repairing the roof of the church. When threatened with exposure, he climbed down and withdrew the notice.

"Too often debts on places of worship, both of Church and Nonconformist, are liquidated by reductions of the teacher's salary. The teacher has to submit or go.

Dismissed for giving evidence on Land Tenure.

"A schoolmaster furnished evidence with regard to land tenure. The offended landed proprietors ranged themselves against him, and endeavoured to secure his dismissal by the School Board. At first they were unsuccessful. A new Board, however, was soon after elected, and the dismissal of the master effected notwithstanding his excellent work and the protests of the people of the village. A schoolmaster must not be a village Hampden, as was shown in the case of Linthwaite.

Dismissed because of "Article 68."

"A girl in a village school passed the Fifth Standard, left school, and became a nurse-girl. After three or four years she returned home. Her father, who was the verger of the parish, secured her appointment as mistress in the school as an 'Article 68.' She refused to carry out the wishes of the master; friction ensued, and the master was dismissed in order that the services of the girl might be retained.

"I am sorry to say it is by no means a rare instance for teachers to have to leave their posts because an incompetent 'Article 68' assistant must be retained, as she is a relation of some member of the School Board or Voluntary management.

Sent adrift for not attending Early Communion.

"A mistress who had charge of a very difficult school, and had done excellent work, was dismissed because she refused to attend early communion. Another clergyman in the immediate neighbourhood, who knew all the particulars of the case, appointed her as mistress of his own school.

Notice to go for taking part in Evangelical Meetings.

"Not long ago, a master, after his Sunday-school duties were over, took a part in some evangelical services in a neighbouring village. His vicar objected to his doing this. He persisted, and was dismissed. Our Union intervened, and, with the assistance of our chairman of the Tenure Committee, succeeded in securing the withdrawal of the notice.

"Compare this case with the preceding one. One teacher refuses to attend a particular religious service; another persists in attending a particular religious service: both get their notice to quit.

New Clergyman, new Schoolmaster.

"Many of the cases of capricious dismissal occur soon after the advent of a new clergyman.

"We have in the office a covering letter from a new clergyman, which accompanied a notice of dismissal, frankly and openly taking up the position which many secretly and covertly try to effect—namely, that a new clergyman should also be accompanied by a new schoolmaster. The letter ran :—

> "'THE VICARAGE.
>
> "'Dear Mr. ——,—I have been perusing the agreement, dated 1st October 1896, between Mr. —— and yourself.
>
> "'I believe that, as a matter of fact, I am not bound by the agreement, but can give six months' notice from any quarter-day. This I do not wish to do, but if you will kindly note that I think it expedient to terminate the agreement at the end of July.
>
> "'I am writing now to give you a better opportunity to look out for another mastership, and I can only say that I shall be most happy to give you a good testimonial as to the discharge of your services and your duties during my vicariate.
>
> "'It is only that I think that when a new vicar comes a new staff is desirable, as it is easier to train a new man into one's ways.—Yours faithfully, ——.'

"The teacher in that case had served in the school for six years. His dismissal was not carried into effect, as, fortunately for the schoolmaster, the clergyman saw trouble ahead.

He refused to chant the Psalms.

"In 1856 Mr. Plant commenced his duties as a schoolmaster at Aston. For nearly thirty-four years he gave satisfaction to every one concerned. Then occurred what, as I have just

DR. T. J. MACNAMARA.

T. A. ORGAN, L.C.C.

pointed out, is frequently a source of Tenure trouble—a new vicar was appointed. Friction soon arose—not, however, in connection with the school (it is rarely that difficulties in school

BRITISH MUSEUM

work create Tenure troubles): Mr. Plant refused to chant the Psalms. In 1890 he resigned his position as choirmaster. From that time the Rev. G. B. Brown, the vicar in question, subjected this old gentleman—aged sixty-three, and one who had served the parish faithfully for thirty-four years—to continual worry and annoyance. Threatened dismissals came fast; more than one definite attempt was made to induce the managers to dismiss Mr. Plant.

"After eight years of such unchristian conduct, success attended the clergyman's persistent and unworthy efforts. In 1898 a pliable body of managers was secured, and Mr. Plant had to go. The appeal of the parishioners was ineffectual; the intervention of the bishop failed; Mr. Plant's request for two years' grace until he was eligible for his superannuation allowance was ignored.

"The Rev. G. B. Brown hardened his heart against all appeals. He determined to crown his eight years of petty persecution with the ruin of his victim. Mr. Plant went. Look at this case from the superannuation point of view. With forty-two years' service behind him, with only two years to serve for his pension, Mr. Plant—a schoolmaster in a public school—is dismissed because he would not chant the Psalms in the parish church.

"When three lawsuits had been instituted, when two schools had been set up in the village where one would suffice, when, under a now obsolete trust deed, a new body of managers had been appointed, Mr. Plant secured his reinstatement. We trust he will remain at his position until he is honourably retired on his superannuation allowance.

"It must be remembered that, but for an almost obsolete trust deed and the National Union of Teachers, Mr. Plant would have been thrust out of his position, and, at the age of sixty-three, deprived of his superannuation allowance.

Dismissed for refusing to sit with Choir.

"The case of Mr. Jewitt is one which specially calls for public attention, as the managers openly take up the position that the teacher of a public elementary school must, as a condition of service, perform extraneous tasks.

"Mr. Jewitt was appointed schoolmaster at Marton-in-Cleveland—a Yorkshire case, by the way. Before accepting the post he refused to undertake Sunday-school work, but agreed to play the harmonium and to train the choir for a fixed remuneration outside his school salary. For two years he played the harmonium, but in 1898, under the doctor's orders, he had to stop playing the organ. He secured a substitute—an acceptable substitute—gave him the whole of his remuneration as organist and choirmaster, and trained the choir for nothing. He usually sat with the choir, but when his wife attended church he sat with her. He was told by the Rev. J. Trevor, the vicar, that he must take his place in the choir or go. He refused, and he went. One of the vicar's letters to Mr. Jewitt said: 'You still refuse to occupy your place in the choir. The matter will now call for official consideration.'

"The covering letter from the vicar, with the notice of dismissal, ran: 'This notice is not to be understood as a dismissal. The main object is to find a schoolmaster who will willingly undertake by agreement the duties of organist and choirmaster in the manner specified by the vicar of Marton for the time being.'

"Here we have a position taken up by many managers privately, stated openly. It is a position which cannot and ought not to be tolerated. I submit that any extraneous tasks must be voluntary, and not a condition of service. This is the case referred to by Sir John Gorst, which I mentioned earlier.

Dismissed because he managed the Village Library.

"Frequently we find cases where teachers are dismissed on account of refusal to perform extraneous tasks. Here is a case where a clergyman tries to prevent the schoolmaster from taking up outside work. The work in question, strange to say, was the management of the village library. The rector told the schoolmaster that he thought the mental care and moral energy expended on the management of a reading-room would be too much for the schoolmaster. We can easily imagine a case in which, if a teacher refused to undertake this mental care and moral energy, he would be dismissed. Why was there so much solicitude for the poor schoolmaster? Well, ladies and gentlemen, the reading-room in question was being run by a lady in the parish, and not by the vicar! The schoolmaster dared to exercise his freedom, and undertook the duties of librarian. The reverend gentleman first tried to get the managers to pass a resolution preventing the schoolmaster from taking part in any work after school hours. In this he failed. He then tried a flank movement. The rector attacked the master's salary. He terminated his engagement, and asked him on what terms he would carry on the school. Terms could not be arranged, so the master was dismissed, and dismissed by the casting vote of the chairman, the rector, who voted twice. This would have relieved the clergyman of the master's presence; but by means of the trust deed the rector and his committee were superseded and a new committee elected, who reinstated the schoolmaster; and he is still there, and will remain, I hope, for many years to come. This case shows that not only do some managers wish to say what a teacher shall do in his spare time, but also what he shall not do.

"Time the Chapel had a turn."

"In 1863 Mr. Jenkins went straight from college to a small village school at Highworth, near Swindon. For thirty years he worked successfully under the management of several clergymen. His reports during the whole of the time were excellent. I have seen his record, and I have no hesitation in saying that any teacher might be proud of such a record.

"Six years ago a School Board was instituted. The first Board was what is known as a Church Board. Mr. Jenkins found no difficulty arise. After three years a Nonconformist Board was elected. One of their first acts was to reduce Mr. Jenkins's salary by £70 a year, hoping, it was alleged, and with some amount of truth, I fear, that the master would leave. Mr. Jenkins at fifty-five, with associations fixed, and knowing the difficulty of securing another post at that age, had to do what is not so uncommon as might be supposed—namely, accept a reduction of salary rather than face a change. Balked in this disgraceful attempt to oust a faithful servant, this set of petty village tyrants watched for an opportunity to renew the attack. They seized the first that came to hand. On a not very serious complaint an explanation from Mr. Jenkins was demanded. The reply was a direct and emphatic denial of the charges. Note the result. No further discussion of the matter took place. No examination of the master's statement was attempted. An appeal to allow the master to appear before the Board in self-defence was promptly rejected. A refusal to accept arbitration followed, although the good offices of Lord Fitzmaurice, the M.P. for the district, and who belongs to the same political party as the tyrannical majority, were available as arbitrator. Dismissal was the only reply. Three months' notice after thirty-two years' faithful service. No inquiry made, no appeal allowed. This was done in the interest of Nonconformity, because the schoolmaster was a churchman. At the indignation meeting which followed the dismissal, I made the same charge as I do now—that the schoolmaster was being dismissed because he was a churchman. I challenged the opponents of Mr. Jenkins to give any other reason for the dismissal. Instead of my challenge being taken up, the statement received corroboration from the other side. One of the speakers opposed to us said the Church had had an innings for thirty years; it was time the Chapel had a turn.

"In Prussia a teacher can be legally dismissed if he changes his religion; in this country the schoolmaster must needs be a sort of Vicar of Bray.

"Let me say here that Mr. Jenkins has not left the village. During the period between his notice of dismissal and its being carried into effect, Mr. Jenkins was re-elected to the Parish Council at the head of the poll. Your Executive thought that if the School Board were determined to sever Mr. Jenkins's connection with the Highworth School, they should not deprive the people of Highworth of his services as parish councillor. Mr. Jenkins remains in the parish until the inhabitants of this township have had an opportunity at the next School Board election of deciding whether Mr. Jenkins shall be schoolmaster in Highworth in spite of the three village tyrants who secured his dismissal. This is one method of appeal. It is costly; it is a disgrace to our educational system that it should be necessary."

The Union's position, the speaker went on to remark, is one of some difficulty, allied as it is to all creeds and parties, whilst knowing neither creed nor politics in its corporate capacity, its sole aim being

The Protection of the Teacher

and the advancement of the scholar.

The position of the teacher also, said Mr. Jackman, is peculiar. He is a public servant controlled by the Government, which ought to see that he is not robbed of his pension by the action of unfeeling managers, as will be the case if tenure does not become more reasonably secure; not that we ask for the *ad vitam aut culpam* position of the judge and clergyman, the president hastened to add, but that the Board of Education should add to the form of agreement issued in the Code a clause to the effect "that no teacher should be dismissed without

Reasonable Cause assigned."

Surely the plain, unvarnished tale unfolded in the Conference room by President Jackman must carry conviction with it, and secure for teachers from the Board of Education the modest amount of security asked for, "so that they may fearlessly perform their duty to the children and the state, and be free to rightly mould the lives and characters of the future citizens of this great empire of ours."

DEPUTATIONS.

One of the most interesting features of Conference is the reception of delegates from kindred associations at home and abroad. Unfortunately these came on when the president had been making great demands on the attention of representatives, so that perhaps not quite so much edification was obtained from the speeches delivered by the members of the deputations as might have been the case; for some, if not all, of our friends had a message well worthy of mental digestion.

M. DESMEDT
(*A French Delegate*).

First in order came Scotland, represented, alas, only by the Vice-President of the E.I.S., on account of the illness of President Blackstock. Mr. Mackenzie testified to the strong feeling of amity existing between the Britons north and south of the Tweed, and especially referred to the Tenure query, which was a burning question not only to the Southron, but also to the teacher of the land of brown heath and shaggy wood.

Ireland had sent Mr. Brown, B.A., F.E.I.S., from Belfast, and Mr. O'Donnell from Kerry, the latter of whom, in an impassioned speech, pleaded for better conditions in Ireland, the way to which was an elected Board of National Commissioners. We were greatly impressed with Mr. O'Donnell's suggestion that much could be done for the conciliation of Ireland by putting the Irish teacher in a better position: this would put him heartily on the side of the Government.

M. Dubus, President de l'Association des anciens Elèves de l'École Normale et des Instituteurs et des Institutrices laïques du Nord, read in English a pretty little speech, the English being an especial compliment to his hosts. He was followed by M. Desmedt of Wargnies-le-Petit, who, in an impassioned speech, in the course of which he asked to be written down as the seeming *rara avis*, a Frenchman who loves England, wished honour and success to England and the elementary teachers of England. M. Desmedt's words evoked thunders of applause, amidst which he beamingly resumed his seat.

The text of his speech was as follows:—

"For the third time I am lucky enough to attend as the official delegate of the teachers of Département du Nord to the educational parliament of the teachers of England. And whether at Cheltenham, at Cambridge, or in the glorious birthplace of our Alcuin, or the residence of the good and generous Philippa of Hainault, I am happy to bear witness that I have always been welcomed as a brother. The hospitality meted out to the French delegates has always been open-handed, not to say lavish, and quite in accordance with the universally acknowledged reputation of the teachers of England.

"You know that I have always visited England and the English people with the keenest satisfaction. For me it is a sense of unparalleled enjoyment to converse with the English protagonists of thought and tolerance.

"But what gives a particular source of happiness to me at your public dinners is to see united round these hospitable boards the great moralising and social influences of Yorkshire—the civic, ecclesiastical, and scholastic authorities. I often wish our Continental nations had the same spirit of union, the same large-mindedness, and the same abnegation of all selfish aims for the sacred interests of the children of the people. Nor do you consider yourselves to be antagonists, but rather mutual advocates, united together in the bonds of friendship. How admirable it is to work in such harmony for the good of one's country! Nor is it possible to do otherwise than admire and applaud your patriotism. This I beg leave to do in my own name and in that of my association.

"It will, however, be useful perhaps to define what we French teachers understand by patriotism. The best definition we can give of our patriotic feelings is to say that patriotism implies the strenuous efforts of all towards the advancement of education, both from a material and moral point of view. By our persevering and loving endeavours to bring about the union of all French citizens, and to make children proud of the rich inheritance they possess, we think we render our country the most useful, if not the most heroic service; yet we consider it a part of our duty, and not the most disagreeable part, to inculcate respect and even love for other nations in the minds of our children. Nor is it, for instance, incompatible with our French patriotism to hold up to their friendly admiration the free institutions and privileges of England; nor, again, will it be so, on my return, to speak to them with affectionate esteem of the educational leaders of this brilliant gathering.

"I wish success to your Union, so admirably organised, so admirably officered. I wish long prosperity to Mr. Graves, one of the principal authors of the Union's being. I wish success to Mr. Devonshire, the president of '75; to Mr. Gray, the devoted friend of the French delegations; and to Mr. Clancy, the high-minded and high-souled, eloquent ex-president, whom I venture to consider a personal friend. Success also to Mr. Yoxall, whose eloquent words, so fraught with experience and frank sincerity, still sound in the ears of the French teachers present at the Lille dinner of '99.

"Success to your ever-expanding Union, within whose fold I hope soon to see teachers of both sexes gathered together. Nor must I forget to wish long prosperity to the members of the local committee, whose kind and hospitable welcome we so highly appreciate.

"Finally, dear brothers, you will, I trust, not think it either inexpedient or impertinent on the part of a Frenchman who loves your country to wish continued health and happiness to the royal patrons of the orphan funds; and last, but not least, to England herself—the land of light and liberty, the pioneer of civilisation, the natural friend and sympathiser of the French democracy.

"I call upon all, in honour of all I have mentioned, to join in a hearty Hip, hip, hurrah!"

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Belgium sent two representatives, both of whom spoke (in French) of the fraternal greeting they were commissioned by their colleagues to bring across the sea to the teachers of England in conference assembled.

Switzerland, for the first time in the annals of the N.U.T., sent a representative—and that a right worthy one—in the person of Dr. Fischer of the Monbijou School, Berne, whose able speech we give *in extenso* as delivered:—

M. VAN DAM
("*Visitor*" *from Holland*).

"We felt ourselves greatly honoured last autumn at the jubilee of the Schweizerische Lehrerverein, when the N.U.T. sent a delegate in the person of one of your most prominent representatives, Mr. Ernest Gray, M.P., who, as we hope, took back with him an agreeable remembrance of the days spent among us.

"With pleasure we accepted the kind invitation to your Conference, and at once determined to send a delegate. As Mr. Fritschi, our president, was prevented from coming, I was appointed to bring you the most hearty and sincere greetings

of five thousand Swiss teachers, the members of our Union. This number, comprising ladies as well as gentlemen, is not much more than the half the total of Swiss teachers. There is one difficulty in our country which prevents many from joining

MR. H. R. MORRELL,
Secy. of Conference Committee.

MR. J. R. BELLERBY,
Secy. of Reception Committee.

our union—a difficulty which does not exist in England—the variety of languages. The greatest number of our members are German Swiss, as the Union was founded in the German part of Switzerland. But yet we have many teachers—I dare say the best ones—of the French and Italian cantons among us, although they have separate associations; for the S.L.V. is working for the improvement of school education throughout our country.

"The Swiss Confederation consists of twenty-two little republics, called cantons, each of which has its own educational institutions, these being more or less different in the agricultural and manufacturing parts of Switzerland.

"The Swiss Constitution says in an article:—

"'Each canton has to provide for sufficient primary instruction, which is under the control of the governmental authorities. The attendance at school is free and compulsory.

"'The public schools must be open to children of every religious faith, without interfering with their religious liberty.'

"However, the means of procuring good instruction for the children are very different in our cantons, some of them consisting of narrow valleys in the mountains with poor cottages, and others containing wealthy towns and manufacturing villages, where the school-houses are the finest buildings of the place. But, indeed, the conviction that the children acquire at school, a capital which is much more worth than their early help in the fields, in the trade, or in the manufactory, is slowly finding its way even in the remotest villages.

"A good deal of emulation has arisen among the authorities and teaching bodies of the cantons by the examination of the young men who, in their nineteenth year, enlist for military service.

"Now a striking fact has been proved by the statistics of those examinations. They have shown that the scale of the results is nearly the same as the scale of the teachers' salaries.

"It is evident that the competition for posts with small salaries is mostly left to persons who are not well fit for educational work. By raising the teachers' salaries we raise their rank in society, the recognition of their profession, and with that we promote the success of their work.

"Surely, if we would establish a rank among the nations for their cultivation of mind and character, we could with certainty declare that nation occupying the first place which spends the largest relative part of its income for public educational work, and which holds its teachers in high esteem.

"As in some parts of our country the population is too poor to provide for good instruction by making the classes small and paying their teachers well, by erecting and outfitting convenient school-houses, we strive in the S.L.V. to get for those our fellow-citizens the help of the Confederation, according to our device, *Einer für alle, alle für einen!* (One for all, all for one).

"The Confederation, the so-called 'Bund,' now supports with considerable sums the higher technical and art schools. With still more right we claim its help for the needy, the weak, to enjoy the benefits of a good education, and to become useful and worthy members of the nation.

"For there is a danger in our democratic institution. The liberties or rights which it grants, especially the so-called referendum—that is, the people's right to vote the laws—they may be abused; the ignorant people could be nothing but a herd of sheep led by ambitious herdsmen. An ignorant man is never a free man, though the constitution of his land be ever so liberal.

"Whenever a nation has given important rights to every citizen, it has to provide for such an education that the standard of cultivation of mind and character enables the voters to make the best use of those rights and liberties.

"Speaking in this place of the task of education regarding the duties of a good citizen, I may well ask—In what country have the best principles of the constitution of modern states arisen and have been carried out first? You all know that better than I do; for it is England.

"English philosophers were the first to say that the state, as a well-organised great society, has not only to establish and to maintain order, but to promote the welfare of all its members.

"And we, teachers of the growing-up nations—we will consider ourselves as the best instruments for the fulfilment of this task.

"We are well aware how manifold are the difficulties which we have to overcome; they are nearly everywhere the same: they are not only poverty and indolence, but also prejudices of many kinds.

"And just as the development of educational work has taken different ways in the different countries, some excelling in one part and being behind in another, we can learn from one another, we can encourage one another, we can even help one another; and to this purpose let us all—you, colleagues of the thriving N.U.T., and you, colleagues of other unions and nations—adopt the device, *Einer für alle, alle für einen!*"

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Mijneer Van Dam paid Conference a special compliment. The Dutch teachers, moved by the Transvaal War, had refused to send any delegate to the Conference; but our old friend came in his private capacity, to show that though the soldier was abroad, the schoolmaster could also be abroad without doing violence to his patriotic yearnings. It goes without saying that Van Dam was well received; and surely his determination to have no slight put on English teachers, so far as he personally could prevent it, will be counted to him for righteousness.

The Co-operative Union brought up the rear with Messrs. Rae and D. Smith, the latter of whom delivered an exceedingly telling speech to a greatly thinned audience. Both speakers showed that there is and there always has been a close connection between the Co-operative Union and the question of the proper education of children, and especially of children of a larger growth. In particular they were anxious to do away with child labour, and to make continuation schools a much greater success than they are at this present time.

Messrs. Jackman and Holden thanked the various deputations, and assured them that their words had not fallen on deaf ears. After which Mr. Hamilton was re-elected treasurer without opposition, and Mr. Blacker of Brighton (who was absent from Conference) was declared vice-president by the votes of 13,711, the candidate coming next to him being Mr. Allen Croft of Nottingham, who polled 7,501 votes. This finished the first session of Conference, but by no means brought the labours of the representatives to a conclusion, for at 5.30 began the annual meeting of the Benevolent and Orphan Funds—other "side shows" being the annual meeting of the Provident Society, the various College Reunions, and the Ladies' At Home; so that all, both men and women, had plenty of occupation from the morning to the evening of this first day of the Conference.

Tuesday.

Eight o'clock on the morning of this second day of the Conference saw many teachers wending their way to the

MR. J. BRUNTON,
Secy. of Sports Committee.

MR. E. HALLAM,
Secy. of Press Committee.

De Grey Rooms, where the National Temperance League, supported by the Lord Mayor and many local notabilities, were waiting to entertain these representatives of the many

teetotal teachers at breakfast. Mr. Fielden Thorp claimed that the connection between education and temperance is a very close one, and urged his hearers to inculcate the sin and shame of drunkenness into their children's minds.

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At ten o'clock exactly the president rang his bell, and business commenced with a full house. The announcement of the result of the Executive election was received with much interest, as the changes were fairly numerous, the following being the newly-elected members—Messrs. Hindmarsh, Sykes, Baddeley, Boulter, Sale, Sandford, Jenkins, and Miss Emma Goodwin. Mr. James Blacker, the newly-elected vice-president, next thanked the members for his election in a few well-chosen words.

School attendance next came under notice, and an important resolution was passed asking for state inspectors of attendance, stipendiary magistrates, and the imposition of cumulative fines; to which was added a rider thanking Sir John Gorst for his Bill, by Dr. Macnamara, who quoted the true story of a mother who explained the absence of her boy from school by saying that he was engaged in carrying home Sir John Gorst's washing.

An attempt to get Conference to declare that the age of retirement upon pension should be reduced to sixty and fifty-five, for men and women respectively, was met by the previous question, it being thought that it would be wiser to wait until the first septennial period had elapsed before asking for a revision of the superannuation regulations, especially as money is just now so very scarce.

A very old Conference friend—*ad hoc*—was next brought forward by the East Lambeth Association, to which Sheffield moved an amendment. As the discussion progressed, it was evident that the principle of electing a body to control all grades of education had a good chance of being supported if the enemy did not basely talk out the Lambeth proposals. Amid some amount of excitement, the president put the resolutions to the vote, and by a large majority they were passed, to the evident satisfaction of many "old hands," who saw with pleasure the re-assertion of the Brighton faith in school authorities elected *ad hoc*.

At the opening of the afternoon session the president declared that Great Yarmouth had been chosen as the Conference town for 1901 by 10,689, Bristol coming next with 6,845 votes. The remainder of the session was devoted to a consideration of the report of the examiners of accounts.

We need hardly say that the work of the representatives was by no means done when the president rang his bell at 5 p.m. At 6 there was a gathering of evening continuation school teachers. From 7.30 to 10 p.m. was the Lord Mayor's reception. At 8.30 the National Federation of Rural Teachers met; whilst at 9 p.m. there was a gathering of the Zealots, who wished to discuss matters connected with the district unions. "And so," as dear old Pepys used to say, "to bed."

Wednesday Morning.

The new Code, which has to be discussed by Parliament after the Easter recess, came up for consideration in the

MISS A. BURDETT,
Secy. of Benevolent Committee.

MISS E. BURDETT,
Secy. of Benevolent Committee.

Teachers' Parliament in this the fourth session. Thanks were given to the Government for the introduction of the beneficent system of the block grant, but later on regret was expressed that schools which had been "foremost" in the past will be penalised in the future, and perhaps to some extent be crippled. The following is the text of the Code resolutions that were moved and seconded by Messrs. Wild and Croft:—

"That this Conference hopes that the spirit of goodwill to-

MISS E. WOLSTENHOLME,
Secy. of the Ladies Committee.

MISS E. CHILD,
Secy. of Conversazione Committee.

wards true educational progress which has inspired the Code for 1900 may, at an early date, obtain—

"1. Recognition of the principle—vitally essential to village schools—that the capitation grant payment does not on its present basis, in its application to the small school, secure an adequate income to supply an efficient, sufficient, and fairly remunerated school staff, together with appropriate school apparatus.

"2. A rate of grants for infants' departments on a scale similar to that for schools for older scholars.

"3. Proper provision for the apprenticeship of pupil teachers under such conditions as will secure for them appropriate professional training.

"4. The reduction in the number of children to each qualified teacher permitted by Article 73 of the Code; and—

"5. The recognition of the principle that none but adult certificated teachers can be considered as responsible members of any school staff."

"At the same time, the Conference feels bound to remind the Education Board that some schools which have been in the front rank with regard to the question of their curricula and the amount of grant earned and spent in them will suffer some loss."

Additions to these resolutions were accepted, regretting the increased power placed in the hands of Her Majesty's Inspectors, and deploring the loss suffered by pupil-teacher centres under the Code.

Mr. Sharples next carried a series of resolutions hailing the new minute on higher-grade schools with satisfaction, but asking that higher-grade classes may be sanctioned by the Board of Education in places not sufficiently large to warrant the establishment of higher-grade schools; that the age limit of fifteen years may be removed, and that scholars may enter on a course at that stage for which their attainments fit them; and that admission to these schools should be open to all scholars, whether from public or private schools.

Resolutions asking for the abolition of the individual examination by Board inspectors and organising visitors were carried, after which the important subject of rural education was dealt with in the following resolutions, which were carried unanimously:—

"That, in the opinion of this Conference, the provision of the School Attendance Act, 1899, which enables a village child of eleven years of age to absent himself from school after having passed the local by-law standard for partial exemption, and having made two hundred and fifty attendances for the year (this number being not much more than half the number of times the schools are open), is educationally disastrous, and altogether out of accord with the pressing national necessity to develop to the utmost the intellectual as well as the material and physical resources of the country in the interests of national defence."

"That even the meagre attendance and acquirement qualifications set down for the village child of between eleven and thirteen years of age seeking employ on the farms and in the fields for half of each of those years, will in many cases be entirely disregarded unless the Education Department is prepared to appoint officials whose business it shall be to see that attendance authorities carry out their own by-laws."

The pleasant duty of acknowledging the hospitality of the town by suitable votes occupied the remainder of this the last public session, which was brought to a close by the presentation of the usual handsomely framed address to the retiring president, Mr. Clancy.

In the afternoon, representatives divided themselves between Bishopthorpe—the residence of the Archbishop of York—and the football field, where the final tie of the Yorkshire Schools' Association Football Championship was won by the Leeds boys by four goals to one. Members of Conference proceeded to the palace by river or by road, and upon arriving were shown over the beautiful mansion, with its interesting little ancient chapel.

MR. H. PRINCE,
Secy. of Visitors Committee.

MR. N. BELLERBY,
Secy. of Dinner Committee.

In welcoming the teachers to Bishopthorpe, the Archbishop of York spoke of the importance of the teacher's work, and accentuated what he thought to be two very important parts of the teacher's task—to wit, the formation of character, and nature study. President Jackman, in thanking the Archbishop for opening his grounds, assured His Grace that those things had not in the past been forgotten, and that in the future, with the new Code, they would receive increasing attention; whilst Vice-President Blacker in seconding did not fail to call the attention of His Grace to the grievances suffered by many of the voluntary teachers of his diocese.

In reply, the Archbishop promised to do what he could to ameliorate the lot of the teacher—both in the diocese of York and in the House of Lords.

The evening was given over to the Conference Dinner in the De Grey Rooms, and to the Grand Conference Concert in aid of the charities.

The dinner was not much of a success, and there was nothing of special importance in the speeches. The following were present:—Mr. Marshall Jackman (president), the Lord Mayor of York, the Lady Mayoress, the Sheriff of York (Councillor Jones), Mrs. Jones, Miss Wilkinson (member of the York School Board), the Rev. G. H. Hewison (chairman of the York School Board), the Rev. E. E. Nottingham (Principal of the York Diocesan Training College), Mr. E. Gray, M.P., Mr. J. H. Yoxall, M.P., the Mayor of Ripon (Councillor Wilkinson), Alderman M'Kay, Mr. W. H. Andrew (York Town-Clerk), Dr. Tempest Anderson, J.P., Mr. T. Clancy (ex-president N.U.T.), Dr. Macnamara, Mr. H. R. Morrell (General Conference Secretary), and Mr. Henry Tennant.

MR. J. W. DODSWORTH,
Secy. of Ball Committee.

MR. W. M. TEMPLE,
Secy. of Excursions Committee.

Thursday.

The morning was occupied by Conference in dealing with domestic matters of a somewhat painful nature, with which, however, we have no concern here.

In the afternoon the purses containing the amounts collected by the associations throughout the country were presented to Lady Middleton in the Jubilee Concert Rooms. The total amount collected was £14,750, 14s. 2d. The Birmingham Trophy was won by the West Ham Association, who presented a total of £1,465, 9s. 9d.; whilst the West Yorkshire Shield was gained by the Scarborough Association, with an average amount per head of £4, 2s. 5d. The pleasing function was brought to an end by the usual votes of thanks.

The Conference Ball took place in the Assembly Rooms, dancing commencing at 9 p.m.

THE PUBLISHERS' EXHIBITION.

The one strictly educational feature of Conference is the Publishers' Exhibition, which yearly increases in scope, in variety, and in quality. Members of Conference who visited York in 1875, and are again attending in the same capacity, must have been struck with the immense strides which have been made in educational appliances during the intervening quarter of a century. The old belief was that anything was good enough for the children; we believe to-day that nothing but the best is good enough for them. Even the most casual visitor to the fine exhibition building in which the publishers displayed their wares must have realised the ability, the energy, and the enterprise which are now lavished on the appurtenances of the school. A glance, for instance, at the reading books, which are prominent on every stall, reveals the literary ability, the editorial acumen, the fine artistry, the mechanical perfection of production which are brought to the service of the young in these happy days when we all profess "to live for our children." A pedagogic Rip Van Winkle, waking up in the Exhibition, would rub his eyes in astonishment at the numberless devices in wall illustrations, maps, drawing sheets, and ingenious appliances for demonstrating scientific facts, and would marvel at the extraordinary perfection which advancing ideals and the stress of close competition have produced. He would hear the tinkle of the harmless, necessary piano, and would imagine himself in an educational heaven when he contrasted the evidence of the present with his experience of the past. And his wonder would still increase when he visited the art section in the gallery, and saw that the silent cultivation of the taste was now cared for in the modern school. In every respect he would find a new educational world as far as material appliances were concerned, and would be puzzled to discover how the teacher of to-day, amidst such an *embarras de richesse*, could possibly make a discriminating selection.

MR. W. CLAYTON,
Sec. of Publishers Committee.

Speaking generally, the Exhibition this year has been well attended, though the divorce of Conference Hall and Publishers' Show, of course, militates against that concourse of interested visitors which is desired and desirable. The appearance of the hall, as we have already indicated, was inspiring in the extreme; and the efforts of the various publishers' representatives to make their stands attractive called for general commendation.

A propos, why should not the Executive of the National Union offer a money prize to the most effectively arranged stall in the Exhibition? By so doing they would mark their appreciation of those who give much time and thought to the work of making Conference additionally attractive and helpful, and would, perhaps, create a stimulus to attendance which appears to be more and more needed as the labours and relaxations of Conference increase and multiply, as they do year by year. The Executive should remember that the proceeds of the Exhibition practically make the Conference self-supporting. The publishers bear the charges ungrudgingly, and it would be a pleasing act of grace if the Executive

THE PUBLISHERS' EXHIBITION.

could be brought to do something to demonstrate their obligation to those gentlemen who year by year labour to make the Publishers' Exhibition a source of instruction and interest.

The York Conference Guide was this year specially prepared and issued for the use of delegates by Messrs. Brown and Sons, Educational Publishers, of York, Hull, and London. In addition to much carefully-selected general information relating to postal facilities, tramways and 'buses, cab fares, train service, city rambles, Conference agenda, etc., the handbook contains a number of interesting and valuable articles, by various writers, on the ancient city of York, under such headings as—"Historic York," "Archæological and Architectural York," "The Educational, Commercial, and Municipal Side of York." The portrait illustrations of Conference officials are numerous and well printed. An admirable reproduction of York Minster appears as the frontispiece, and this is followed by many beautiful pictures of places in and around York. Altogether the work is a most creditable production, and grateful thanks are due to Messrs. Brown and Sons for the care and attention shown in the preparation of this handsome and most charming of Conference souvenirs.

"GLEANINGS FOR THE FATHERLESS."

A Souvenir of the Teachers' Orphanage Effort.

This little book, issued under the appropriate title of *Gleanings for the Fatherless*, represents one phase of the work of the N.U.T. The energy expended on the extension and upkeep of the magnificent charities of the Union is at once the envy and the admiration of less self-sacrificing and enthusiastic societies.

Looking round the array of writers who have had, or who still have, personal experience of teaching, Mr. H. F. Russell, London, was struck with the happy idea of enlisting their services in aid of the Union charities, particularly of that charity known as the Passmore Edwards Orphanage, in which the teachers of the metropolis feel so great and so justifiable a pride. The response to his appeal was generous, and this volume is the result.

Where so many have aided in this good cause, it would be invidious to particularise. But we may perhaps draw attention to the characteristic contributions of the Messrs. Zangwill, Dr. Macnamara, Dr. Gunn, Dr. Parrott.

Mr. I. Zangwill's story of the Latin Quarter is one of the few in the volume which have not had their direct inspiration from the teaching experience of the author. It will not for that reason be any the less popular with readers.

But, on the whole, we think that Dr. Gunn's contribution will best repay the attention of teachers, who will be, after all, the greatest buyers of the book. While the manner of presentation of the subject gives much added interest to the doctor's contribution, it is in the subject itself that the chief interest centres. The Orcadian (we feel strongly inclined to write Arcadian) boy, his work, his play, and his surroundings—here we have to benighted Southerners a new and entrancing subject. We venture to think that this little sketch of the conditions of education in Orkney is worthy of expansion and of a more extended audience.

The illustrations of the volume are, like the literary matter, freewill offerings, and criticism would be out of place.

Altogether, we have much pleasure in directing the attention of our readers to this interesting and unique little work, not only because of good value given for the shilling, but because, while helping themselves to an afternoon's pleasant reading, they will be contributing to the success of the great charities of the N.U.T.

THIRD YEAR STUDENTS ABROAD.

Circular to Residential and Day Training Colleges.

Education Department,
Whitehall, London, S.W., *March 23, 1900.*

Sir,—Permission to take a third year of training abroad was first given to specially recommended students in 1893, and since that date a few students have every year availed themselves of the privilege allowed by Article 120 of the Code. My Lords have recently made careful inquiries as to the value of this kind of training, and the conditions which should be attached to it, and they desire to acknowledge the valuable assistance which they have received, both from the authorities of various training colleges, and from many of the students who have had personal experience of the system.

The evidence goes to show that a year's residence abroad has proved of great benefit to students in the following ways:—

1. It has widened their general culture and experience.

2. It has given them a much more thorough knowledge of the language of the country to which they have been sent than they could otherwise have acquired. Such knowledge has proved specially valuable in the case of those students who were sent to France, and whose subsequent work as teachers has lain in training colleges or pupil-teacher centres.

3. It has enabled them to improve their methods of teaching through their observation of the methods adopted abroad.

My Lords desire to indicate for the guidance of the authorities of training colleges the general principles upon which they propose to act in administering the provisions of the Code in question.

I. *As to the Selection of Students.*—The authorities of the training college, in making their application to the Department, should define the special aim of the student's residence abroad. With a view to the satisfactory fulfilment of this requirement, which necessarily presupposes an intimate knowledge of the student's bent and capacity, the selection should not be made earlier than the spring of the student's second year. The authorities of the training college will be at liberty to modify the aim originally proposed if circumstances arising after the student has entered into residence abroad render it advisable, and if the approval of the Department to such modification be obtained.

Some study of foreign educational methods and school organisation should form a necessary part of the student's work abroad. Such study need not be widely extended in its scope, and should not form a hindrance to the continuance of the student's general education. It would be considered sufficient if it bore somewhat the same proportion to the other studies as the professional course (Part I.) bears to the literary course in the case of third year students working in the training colleges in England.

The student about to proceed to France should, as a rule,

possess sufficient proficiency in the French language to enable him to carry on a simple conversation. In the case of a student sent to Germany, a conversational knowledge could hardly be expected; but he should, if possible, have some acquaintance with the elements of the grammar and vocabulary.

The authorities of the training college will be held responsible for ascertaining that the student satisfies these conditions, and should be prepared to furnish the Department with a certificate to that effect. The conditions might, however, be relaxed, with the approval of the Department, in the case of any student who proved himself to possess marked linguistic talents.

II. *As to the choice of the Place to which the Student is to be sent.*—Principals of training colleges desiring information and advice as to the selection of places abroad should apply direct to the Director of Special Inquiries and Reports, Education Library, St. Stephen's House, Cannon Row, London, S.W. As a rule, only one student at a time should be sent to a place, but this condition might be relaxed in the case of places such as Paris and Jena. The student should ordinarily remain in the place selected throughout his course.

III. *As to the Residence Abroad.*—The student should always be attached to some foreign training college or institution, and should be introduced to some person of recognised standing in the place selected, to whom he might refer in case of difficulty. In the case of a woman-student residing in Paris, it is an indispensable condition that the lodgings for her should be selected by, or under the supervision of, Miss Williams of the Franco-English Guild.

The student should submit to the authorities of his or her training college once in every three months a report of a formal character on some subject selected by them from a list of subjects offered by the student. The last report, or the last two reports, should be in the language of the country in which the student is residing. These reports should be available for Her Majesty's Inspector at his visits to the training college. Students spending a third year abroad will be required, as heretofore, to take Part I. of the Certificate Examination for third year students, and to give a lesson before Her Majesty's Inspector.

It is particularly requested that all applications for permission to send students abroad may be made to the Department *not later than the 1st May.*—I have the honour to be, Sir, your obedient servant, G. W. KEKEWICH.

THE CURRICULUM OF THE RURAL SCHOOL.

CIRCULAR TO MANAGERS AND TEACHERS OF RURAL ELEMENTARY SCHOOLS.

BOARD OF EDUCATION,
WHITEHALL, LONDON, S.W., *April 1900.*

SIR,—The Board of Education are anxious to call the attention of managers and teachers of elementary schools situated in the agricultural districts of England and Wales to the importance of making the education in the village school more consonant with the environment of the scholars than is now usually the case, and especially of encouraging the children to gain an intelligent knowledge of the common things that surround them in the country. From experience gained in various districts, it is found that by a suitable arrangement and handling of the school curriculum this object can often be attained without necessarily adding any new subjects to the time-table, or demanding any undue burden or work from teachers or scholars.

The Board would deprecate the idea of giving in rural elementary schools any professional training in practical agriculture, but they think that teachers should lose no opportunity of giving their scholars an intelligent knowledge of the surroundings of ordinary rural life, and of showing them how to observe the processes of nature for themselves. One of the main objects of the teacher should be to develop in every boy and girl that habit of inquiry and research so natural to children; they should be encouraged to ask their own questions about the simple phenomena of nature which they see around them, and themselves to search for flowers, plants, insects, and other objects to illustrate the lessons which they have learned with their teacher.

The Board consider it, moreover, highly desirable that the natural activities of children should be turned to useful account—that their eyes, for example, should be trained to recognise plants and insects that are useful or injurious (as the case may be) to the agriculturist; that their hands should be trained to some of the practical dexterities of rural life, and not merely to the use of pen and pencil; and that they should be taught, when circumstances permit, how to handle the simpler tools that are used in the garden or on the farm, before their school life is over.

The Board are of opinion that one valuable means of evoking interest in country life is to select for the object lessons of the lower standards subjects that have a connection with the daily surroundings of the children, and that these lessons should lay the foundation of a somewhat more comprehensive teaching of a similar kind in the upper standards.* But these object lessons must not be, as is too often the case, mere repetitions of descriptions from text-books, nor a mechanical interchange of set questions and answers between teacher and class. To be of any real use in stimulating the intelligence, the object lessons should be the practising ground for observation and inference, and they should be constantly illustrated by simple experiments and practical work *in which the children can take part*, and which they can repeat for themselves at home with their own hands. Specimens of such courses can be obtained on application to the Board of Education. These may be varied indefinitely to suit the needs of particular districts. They are meant to be typical and suggestive, and teachers, it is hoped, will frame others at their discretion. Further, these lessons are enhanced in value if they are connected with other subjects of study. The object lesson, for example, and the drawing lesson may often be associated together, and the children should be taught to draw actual objects of graduated difficulty, and not merely to work from copies. In this way they will gain a much more real knowledge of common implements, fruits, leaves, and insects than if these had been merely described by the teacher or read about in a lesson book. Composition exercises may also be given—after the practical experiments and observations have been made—for the purpose of training the children to express in words both what they have seen, and the inferences which they draw from what they have seen; and the children should be frequently required and helped to describe in their exercise books sights of familiar occurrence in the woods and in the fields. Problems in arithmetic connected with rural life may also be frequently set with advantage.

The Board of Education also attach considerable importance to work being done by the elder scholars outside the school walls, whether such work takes the form of elementary mensuration; of making sketch-plans of the playground and the district surrounding the school; of drawing common objects; of paying visits of observation to woods, lanes, ponds, farms, and other suitable places, under the guidance of the teacher; or of the cultivation of a school garden.

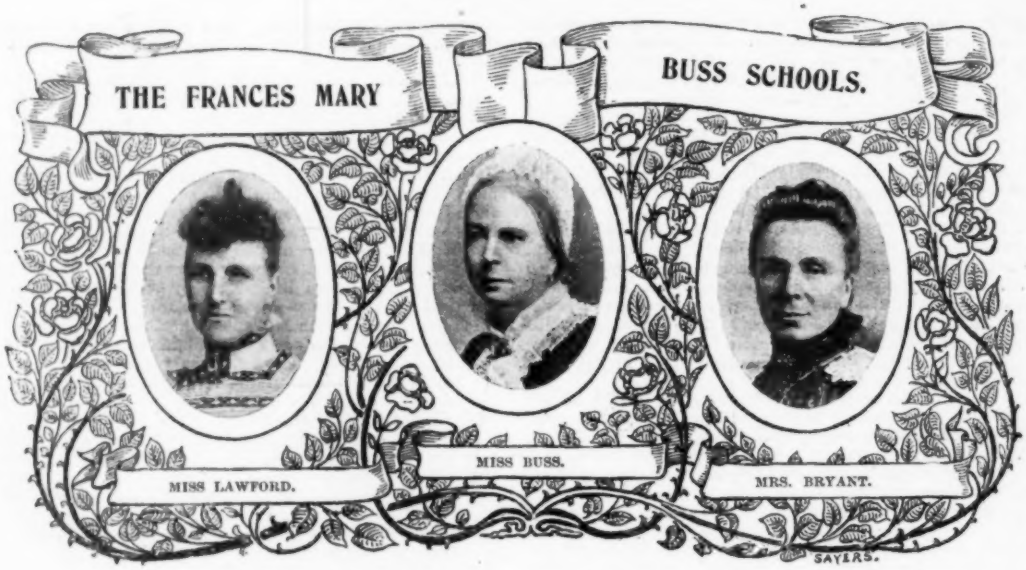
The teacher should, as occasion offers, take the children out-of-doors for school walks at the various seasons of the year, and give simple lessons on the spot about animals in the fields and farmyards, about ploughing and sowing, about fruit trees and forest trees, about birds, insects, and flowers, and other objects of interest. The lessons thus learned out-of-doors can be afterwards carried forward in the schoolroom by reading, composition, pictures, and drawing.

In this way, and in various other ways that teachers will discover for themselves, children who are brought up in village schools will learn to understand what they see about them, and to take an intelligent interest in the various processes of nature. This sort of teaching will, it is hoped, directly tend to foster in the children a genuine love for the country and for country pursuits.

It is confidently expected that the child's intelligence will be so quickened by the kind of training that is here suggested that he will be able to master, with far greater ease than before, the ordinary subjects of the school curriculum.

The Board would further urge upon any teachers now in rural schools who happen themselves to be of urban upbringing, or to have been trained in urban centres, to seize every opportunity of gaining a closer insight into the special conditions and problems of rural life; and they trust that those whose previous education has not enabled them to obtain full knowledge of the main principles and phenomena of rural life and activities, will be able to attend such holiday courses and classes as may be placed within their reach for this purpose by County Councils or other local committees; since it is only when the teacher is genuinely interested in, and well informed about, the occupations of country life that any such results can be looked for in the children as have been referred to as the proper object of rural schools in the present circular.—I have the honour to be, Sir, your obedient servant, G. W. KEKEWICH.

* The important points to be observed in all object teaching were set out in the official circular (No. 369) issued on this subject on June 25, 1895, copies of which may be obtained from the Board of Education.



THE JUBILEE OF A FAMOUS SCHOOL.

THE curious stranger who joined the throng of worshippers—some two thousand strong—at St. Paul's Cathedral on the evening of 3rd April was well repaid for his trouble, even if he contemplated the imposing procession and the hearty service that followed from a mere spectacular point of view. What he saw may be feebly described as follows:—Whilst the huge congregation was singing the Hundredth Psalm, there proceeded along the nave, from the north-west chapel, a company of women wearing the robes of university graduates, and followed by certain officials representing the universities of Oxford, Cambridge, St. Andrews, Glasgow, London, and Wales, various university colleges, the Head-masters' Conference, the Head-masters' and Head-mistresses' Associations, the Teachers' Guild, the Technical Education Board, the Clothworkers' and Goldsmiths' Livery Companies, who in turn were succeeded by a goodly company of priests, including the Primate of all England, the Bishop of London, and the Master of Trinity College, Cambridge. The stranger's curiosity—awakened, most naturally, by this imposing array of English men and women of light and leading—was satisfied by the Bishop of London, who read

A Commemoration of the Founder and Benefactors

of—a school! and that, too, a school for girls—to wit, the N.L.C.S.G., as the initiated like to speak of the North London Collegiate School for Girls.

"Now, according to our bounden duty, let us thankfully commemorate before Almighty God our pious founder and all our benefactors, by whose liberality the glory of God hath been advanced, Christian religion and good learning propagated, and these schools endowed with special benefits, and enlarged with manifold and singular privileges. And in the forefront we commemorate Frances Mary Buss, who did, in the year 1850, found a school for girls in North London, and under whose fostering care, for forty-and-five years, virtue and studies grew and prevailed in it, and it attained to its full growth in the two schools now called by her name. Let us therefore praise God chiefly for this our founder, who gave of her best gifts of mind and will and Christian example to establish her work in the fear of Him, and for the glory of His holy name. And after her we commemorate those who gave likewise, though in less abundant measure, of their spiritual gifts to the same good end, especially David Laing, sometime incumbent of Holy Trinity Church, Kentish Town, in early years honorary superintendent of the school, and teacher of the Holy Scriptures; Frances Buss, the mother of the founder, who made the nurture of the younger children her special care; Robert William Buss, the father of the founder, zealous in the teaching of science and art; and others still amongst us, benefactors of the schools from the outset, and ever to be remembered by the scholars, now and in time to come. We are also bound gratefully to commemorate those who have enriched the schools with land and tenements—the Worshipful Company of Brewers, governors of the trust estates of Richard Platt, alderman of the City of London, and Dame Alice Owen, who provided each of the schools with suitable sites and buildings; the Worshipful Company of Clothworkers, who built the Great Hall of the schools, and on the death of the founder, in the year 1894, placed therein a window in her memory. We commemorate also all benefactors who have furnished encouragement to sound learning and religious instruction by the endowment of exhibitions to the universities, scholarships and prizes, and in particular the Worshipful Company of Brewers, governors of the trust estates of Richard Platt, and the Worshipful Company of Clothworkers. Of those who have in like manner rewarded proficiency in various branches of learning, we here commemorate John Back, sometime rector of the parish of St. George the Martyr, Holborn, who founded a prize for knowledge of Holy Scripture; Eliza Crane, who founded a scholarship in acknowledgment of educational benefits to her daughters; the National Health Society; and the several groups of friends and pupils who founded scholarships in memory of the founder, and of Robert William Buss, Emma Maclean-Fraser, and Jane Agnes Chessar, teachers in the schools. We commemorate also those who in their lifetime have encouraged studies by annual gifts and prizes. Among these, the first in time were Mary Elizabeth Laing, and Susan, seventh Countess of Hardwicke, whose custom of awarding annually a prize for general diligence has been continued by her daughter to the present time. And many others there be who have followed, and do now follow, these goodly examples in liberality. For these our founder and benefactors, whose services we have thus publicly recited to the glory of God, to the perpetuating of their memory, and to the testifying of our own thankfulness, we bless and praise Almighty God."

Every thoughtful patriot, to say nothing of every enlightened teacher, will rejoice greatly that the education of women has made such vast strides as to entitle it to such notice from such men as took part in this notable ceremony; for, as the Archbishop of Canterbury rightly insisted in his sermon, "we should thank God that we are already beginning to see more clearly than before how woman should be dealt with in the matter of her education, the proper ordering of which will go far to answer the question of Solomon" which the archbishop took as his text—namely, "Who can find a virtuous woman? for her price is far above rubies."

The jubilee proceedings, begun so fittingly in praise and thanksgiving in the Cathedral, were continued on the morrow at the school, when Miss Begbie—who was a scholar in the

school fifty years ago, and is still on the staff—was presented with a purse of sovereigns, and Mrs. Bryant, the headmistress, with a portfolio containing a portrait of every girl now in the school; and when friends from far and near were entertained by the pupils, who exhibited specimens of work done, sang a cantata specially composed by Mr. Farmer, gave a gymnastic display, and in many other ways bore eloquent witness to the many-sided training they receive in the school of which they are so justly proud.

The Schools.

The North London Collegiate and Camden Schools, which now number together about nine hundred pupils, had their origin in a private school, conducted from 1845 to 1850 by Mrs. Buss and her daughter Frances Mary Buss. In 1850 the school was called the North London Collegiate School; and here, assuming a more public character, the school may be said to have actually begun its life. In 1863 Parliament appointed the Schools Inquiry Commission, before which, in 1865, Miss Buss and Miss Davies gave evidence which moved the minds of men to concert measures for the setting of the Camden Schools on a permanent footing, which, thanks to Lord Lyttelton and the public feeling of the inhabitants of St. Pancras, was accomplished in 1869, when a trust was formed for carrying on the existing school and founding another—the one as a first-grade, the other as a second-grade school. The Upper School thus constituted removed a year later, with its two hundred scholars, to 202 Camden Road. The Lower School took over the old buildings, and was endowed by the generous Miss Buss with all the school furniture and plant belonging to the old school in Camden Street.

The fees sufficed to meet current expenses only: to find rent and provide buildings fell to the lot of the devoted band of women, with Miss Buss at their head, to whose labours the ultimate success of the scheme was due. It speaks volumes, both as to the public apathy with respect to the education of women, and as to the perseverance of Miss Buss and her friends, that £700 was collected in two years. To cover the deficit Miss Buss had to forego a large part of her salary every year until 1874, when at length, thanks to the Endowed Schools Commissioners, and to the Brewers' and the Cloth-workers' Companies, a sum of £20,000 was made available for the building of proper rooms for both schools—the present handsome buildings of the N.L.C.S.G. having been opened in 1879 by the Prince and Princess of Wales.

Even now the school is not in the sound financial position in which one could wish to see so noble an institution. There is no reserve fund, so that misfortune—which may, undeservedly, come to movements as well as to individuals—would find the school ill prepared to withstand it. Further, there are no playing-fields within easy distance of the school, so that the girls have to travel several miles for their hockey, etc.—a most undesirable thing in any case, but more especially so in the case of girls. We know that it would gladden the heart of Mrs. Bryant—whom we have to thank for her courteous reception of ourselves, and for much of the information contained in this article—if these two sources of anxiety could be removed.

The School Building and Routine.

Entering the school with the girls in the morning, we should proceed first through the entrance-hall down to the basement and into the cloak-rooms. Here each girl has a numbered place provided with hooks for cloak and hat, umbrella-stand and boot-rack, besides a bag for the house-boots which she always wears while in school. Here also are shelves for books while dressing proceeds, and forms for use in changing boots. Since the space allotted is ample, and the girls come in relays both before and after school, crowding is avoided.

When ready, each girl goes upstairs with her boots to the Great Hall, where the rule of silence is strictly enforced. At 9.15 all are assembled for prayers, each form in its place, while the prefects, who are members of the Sixth Form, and are elected by it and the teachers of the upper division of the school, are, during the interval of waiting, scattered among the other forms, as guardians of public order. After prayers each form marches out with its mistress to its own room. Five classrooms open out of the hall on the ground floor; these are used by the divisions of the Fifth Form. Five more open out of the hall gallery, used by all the divisions of the Fourth Form. Above these two tiers there is a third set of rooms, three classrooms, and the drawing school. The lower divisions of the school use these three rooms, besides one of the irregularly-placed rooms. Of the latter there are several used for lessons to sub-divisions, lying, with the laboratories, lecture-room, libraries, and music rooms, on the side of the great stone staircase opposite the Great Hall. The Sixth Form uses the rooms otherwise devoted to the Library and Museum.

Each classroom contains 5,600 cubic feet, and is fitted for thirty-two girls. All have Swedish desks, except the elder girls, who have separate desks with chairs. There is a raised platform for the teacher, with a chair and table. Many of the rooms are provided with window gardens, in which the girls take, for the most part, great pride.

In these rooms the hard work of the day goes on till 1.30, with an interval, as near the middle as possible, of twenty-five minutes for a light lunch and drill. In five separate relays the girls proceed to the dining-hall, which, with the kitchens and housekeeper's rooms, lies under the Great Hall. Here they can buy buns, biscuits, bread-and-butter, fruit, coffee, milk, and lemonade, and, while talking as loudly and as much as they please, they are required to take their stand in orderly lines across the room. From the dining-hall the girls proceed to the gymnasium, a fine room, 100 feet long by 30 feet broad, where they have musical drill for a quarter of an hour. Monday and Thursday, however, are days for special calisthenic exercise, lasting half an hour each day. Then work is resumed till 1.30, when the school is dismissed in relays as before stated.

Music for all who study it, and drawing for the elder pupils, are taught in the afternoon. Children are also allowed to prepare their home lessons at school, if so desired by their parents, in the afternoon, under the care of a teacher. There are gymnastic classes every afternoon, and a cookery class once a week. Otherwise the children go home at 1.30, and do not return. Those who stay can have dinner at school for 1s. each, or 10s. per dozen dinners; and every girl must have dinner or lunch. When a girl has to stay in the afternoon, a note is sent to her mother or guardian requesting permission; and without the production of the reply, duly signed, she is not allowed to stay. Thus the mother has always certain knowledge of the times when her daughter is at school, and at what hour she should be at home.

The Ideal.

Public school masters will tell you to this day, as they told Quick when he was a master at Harrow, that a teacher stands in need of no special training for his work. Scholarship, in their opinion, is the one thing necessary, so that even nowadays it is the exception for a public school master to undergo any special training for his work. The mistresses of public schools, on the contrary, are almost invariably trained teachers—nay, *well*-trained teachers—knowing not only methods but also principles; and it is again Miss Buss who has to be commemorated, not only as the founder of a school, but as the apostle of sound educational doctrine. In this connection may be mentioned the zeal with which she entered into the work of founding a Head-mistresses' Association, and the support that she gave to the Maria Gray Training College, the Cambridge Teachers' Training Syndicate, and, indeed, to all agencies for the proper training of teachers. She was indeed a mother of teachers, and of her it may justly be said that, being dead she yet speaketh, and that, too, in scores of schools where the rational teaching of mistresses who, thanks to her influence, have, after much diligent labour and heart-searching, come to realise, in some measure, that the true inwardness of teaching develops the minds of feminine young England on sound lines. In a word, Miss Buss was a notable educational reformer; and in this, as in most respects, Dr. Sophie Bryant, the present head-mistress, is entirely in harmony with the views of the founder. Indeed, the success of the N.L.C.S.G. is in no small measure due to the fact that for forty-five years there was no change in head-teacher, and that when, in 1896,

death brought about such a change, Mrs. Bryant, who for so many years had been completely in the confidence of her chief, was wisely chosen to carry on the good work on the old lines. It would be difficult to find, throughout the whole of the teaching profession, a teacher better versed in all that makes for the development of a true teacher than Dr. Bryant. Her *Studies in Character* and *The Teaching of Morality* are standard works on the most difficult and most vital parts of the teacher's work; and Miss Buss has taught not only Mrs. Bryant, but also hundreds of other inspired teachers, who, to quote the words of Mrs. Bryant, have learned that "the ideal of education is a harmonious and healthy development of mind and physical powers in relation to knowledge and the practical purposes of life:" moreover, they know full well that "education has failed of its purpose where there is no development, or one-sided development, or where development is over-rapid and exhausts strength;" and well do they "work in hope," as their school motto bids them, when the hope is founded upon a knowledge of how it may best be realised in the attainment of the desired success.

School Successes.

We have left but a few lines in which to refer to the academical distinctions that have been won all the world over by the *alumnæ* of the N.L.C.S.G., notwithstanding the fact that these successes fill more than a hundred pages of the *Jubilee Calendar*, which is before us as we write. Doctors of Medicine, Doctors of Science, Masters of Arts, Bachelors of Science and of Arts, scholarships innumerable, testify to the soundness of the foundation, laid at the N.L.C.S.G., upon which these higher successes were built, and are now being built, not only in England, but in many places far distant from these shores. As a specimen, we give the career of Mrs. Percy Flemming, one amongst many of the women who have distinguished themselves in medicine:—

Wood, Emily E. Entered January 1871. Left July 1880.
[*Mrs. Percy Flemming.*]
1876. Jun. Camb., Class III.
1879. Sen. Camb., Class II.
1880. Matriculation, 62nd in Honours.
Girton Coll. Entrance Scholarship.
Clothworkers' Leaving Scholarship.
1882. Nat. Sci. Tripos, Part I., Class I.
1884. Nat. Sci. Tripos, Part II., Class II.
1887. Preliminary Scientific.
1889. Int. Med., 3rd Class Honours in Physiology and Histology.
1891. M.B.
1893. M.D.
Formerly Demonstrator of Anatomy, London School of Medicine for Women, and Medical Registrar, Royal Free Hospital.
Now Physician to Children's Out-Patient Department, and Pathologist, New Hospital for Women. Practises at 31 Wimpole Street.

Thanks to "The Girls' Realm."

In conclusion, we beg to most heartily thank our contemporary *The Girls' Realm*, to whom we are indebted for the portraits of Miss Buss, Dr. Bryant, and Miss Lawford, and in whose pages may be found further particulars concerning this interesting school.

THE INSTRUCTIONS TO INSPECTORS.

Preliminary.—The somewhat belated Instructions are now to hand, and the first word to be said concerning them is that they emphasise the spirit of reasonableness that all practical teachers have been pleased to find in the Code. The drastic changes to which we have already called attention have naturally evoked a more lengthy introduction than is usually the case. The policy of financial stability, of elasticity, and of trusting the teacher has, we are told, proved so beneficial "that a further advance in the same direction may now safely be taken," and most truly it is claimed that the new Code is such a further advance. The most important of the recommendations refer to:—

The Punishment Book, which is to be kept in every school, and which Her Majesty's Inspector is enjoined to examine; further, he is told that discipline "which is maintained harshly or by the aid of corporal punishment" is not to be considered satisfactory. Teachers will heartily agree with this, and, moreover, they will do well to assist the Board of Education in freeing the schools from the slasher who uses the cane except as a *dernier ressort*. The profession has no greater enemy than the short-tempered, irrational teacher who gives colour to the belief that the teacher is a man with a cane. Those who live by the cane should, for the good of the profession, perish by the cane; which is evidently the wish of the newly-constituted Board.

Improved Books and Apparatus.—"You should particularly call the attention of the managers to any improvements desirable in the school apparatus or in the supply of books, as well as in the school premises and playgrounds." No one can question the wisdom of this instruction, which will undoubtedly be acted upon.

Attendance.—"In any schools where you find the attendance is habitually bad, you should report the facts to the Department, together with a statement of the reasons which appear to you to account for the low attendance." Little is to be expected from this. What we want is the appointment of a special court for dealing *quickly* with offenders. The present farcical condition of school attendance is due mainly to the circumlocution that, under present conditions, appears to be inevitable.

Labour Certificates.—The inspector is at liberty to refuse to examine individuals "if a special examination for labour certificates is about to be held at some convenient place."

Simultaneous Reading.—It seems somewhat absurd to say that "habitual simultaneous reading aloud may become mischievous, as tending to distract the teacher's attention from the pronunciation of individual children." What should be said is that no class should be so large as to make simultaneous reading at all necessary; for so long as mammoth classes exist, so long will simultaneous reading be resorted to.

Composition, although prescribed only for the standards above the fourth, should, as far as circumstances admit, be encouraged in the lower standards also, "because—(1) it is more educational than dictation; and (2) in framing sentences of their own, children learn to spell correctly the words which they commonly use." To all of which we readily cry, "Agreed!"

Honour Boards.—These are encouraged as worthy of approval; but not only are we to inscribe, as is our wont, the names of scholarship winners thereupon, but more especially "the names of any former scholars who have distinguished themselves by acts of heroism and self-sacrifice, or who have earned in other ways a high place in their country's regard." This is excellent, and perhaps by-and-by we shall have the Union Jack floating over our schools, just as on the Continent the national flag is displayed on the national schools. There is plenty of room for improvement in the teaching of patriotism in the people's schools.

Cookery.—Her Majesty's Inspector is to request managers to visit the classes, to examine registers, and to supervise the work.

Household Management.—The teacher should be grounded in cookery, laundry work, practical housewifery, elementary hygiene, and physiology. A class should not consist of more than fourteen girls, and the instruction given should comprise the usual subject of domestic science, together with the practical teaching of house management. It is not intended to train servants, but to fit girls for the various domestic duties which devolve more or less upon all women.

Between Morning and Afternoon School.—This interval must not, except under very special circumstances, be less than an hour. Under no circumstances can it be less than half an hour.

Under Five.—After September 1, 1900, separate registers and summaries must be kept for children under five.

Pupil Teachers.—Attention is drawn to the fact that some of the Departmental Committee's recommendations are this year adopted, and Her Majesty's Inspector is instructed to see notebooks and hear lessons as to foreign languages, and to examine the pupil teachers in copy-setting on the blackboard.

How often does the teacher spend hours of anxious thought over some of his boys who are difficult to manage! Such teachers will turn with interest to a paper in the April number of *The Leisure Hour*. It is a summary of papers sent in by teachers for a competition on the subject of "Troublesome Pupils, and How I Dealt with Them." Many valuable suggestions and bits of personal experience are given. Mr. Birrell's paper on the poet Cowper is another of the many interesting contributions to be found in this issue.

HIGHER ELEMENTARY SCHOOLS.

(*Minute of the Board of Education.*)

April 6, 1900.

A PUBLIC elementary school may be recognised by the Board of Education (hereinafter called the Board) as a higher elementary school under the following conditions:—

1. The school must be organised to give a complete four years' course of instruction approved by the Board.

2. No child shall be admitted into a higher elementary school unless he—

(i.) Has been under instruction at a public elementary school, other than a higher elementary school, for at least two years; and

(ii.) Has been certified by an inspector of the Board to be qualified to profit by the instruction offered in the higher elementary school.

3. The fitness of any child to continue, or be promoted from one year's course to another, in a higher elementary school, shall be certified by an inspector of the Board.

4. (i.) Attendances may not be recognised in a higher elementary school for any scholar who is upwards of fifteen years of age; and

(ii.) No scholar may remain in a higher elementary school beyond the close of the school year in which he or she is fifteen years old.

The average attendance for any period is found by dividing the total number of attendances made during that period by the number of times for which the school has met during such period. For the purposes of reckoning the average attendance at a higher elementary school, an attendance shall mean attendance during two and a half hours.

5. (i.) The school year of every higher elementary school is the year ending on 31st July, and no scholar may be admitted for any year's course later than 1st November.

(ii.) After November 1, 1900, scholars newly admitted into a higher elementary school must commence with the first year course.

6. *Temporary Article.*—Up to August 1, 1901, the qualification for admission to the first year course shall, as a rule, be competency to pass Standard IV. of the Code as shown to the satisfaction of an inspector of the Board.

7. (*a*) The school must be shown, to the satisfaction of the Board, to be necessary in the locality; and

(*b*) The premises must be recognised by the Board as suitable for the purposes of a higher elementary school.

8. The teaching staff of the school must possess such qualifications as may be laid down from time to time by the Board for the purposes of a higher elementary school.

In the first and second year courses there shall be a teacher, accepted as qualified by the Board, for every forty scholars (or less); in the third and fourth year courses there shall be a teacher, so qualified, for every thirty scholars (or less) in average attendance.

The grant may be reduced at the rate of not more than 10s. per annum for every unit of annual average attendance above the number for which the school staff is recognised by the Board. This reduction will, as a rule, be one-twelfth of 10s. for every month during which the staff has been insufficient for the annual average attendance.

9. The managers of any school who desire such school to be recognised as a higher elementary school must submit for the approval of the Board, before the 1st July in any year, proposals for a curriculum and time-table, and supply such other information as may be required by the Board.

10. The grants made to higher elementary schools are as follows:—

(i.) *Principal Grant.*

	Higher Scale.	Lower Scale.
First year	27s.	25s.
Second year	35s.	33s.
Third year	47s.	40s.
Fourth year	65s.	55s.

The Board shall decide which, if either, of these grants shall be paid, in the case of each year's course, after considering the report and recommendation of the inspector upon each of the following four points:—

(*a*) The suitability of the instruction to the circumstances of the scholars and the neighbourhood.

(*b*) The thoroughness and intelligence with which the instruction is given.

(*c*) The sufficiency and suitability of the staff.

(*d*) The discipline and organisation.

The inspector will recommend the higher grant unless he is unable to report favourably upon the school under these heads.

(ii.) *Grant for Practical Work.*

	Higher Scale.	Lower Scale.
First year	8s.	6s.
Second year	12s.	10s.
Third year	18s.	15s.
Fourth year	25s.	18s.

This grant will only be awarded where special provision for such work, as regards premises and equipment, is made to the satisfaction of the Board. The Board shall decide which, if either, of these grants shall be paid, in the case of each year's course, after considering the report and recommendation of the inspector upon each of the points named in paragraphs (i.) (*a*) to (*d*) of this section.

11. No grant may be received from the Board of Education by any higher elementary school in addition to the grants named in Section 10 of this Minute, with the exception of the fee grant.

12. No member of the teaching staff may undertake duties not connected with the school which may occupy any part whatever of the school hours.

13. Separate registers and separate accounts must be kept for the higher elementary school.

14. No scholar may attend a higher elementary school who is attending an evening school or class under the regulations of the Board. This does not apply in the case of a scholar attending an art class above Group I, under the regulations of the Board.

Given under the seal of office of the Board of Education, this sixth day of April in the year one thousand nine hundred.

G. W. KEKEWICH, *Secretary.*

ELEMENTS OF TRAINING.

BY DR. FRANCIS WARNER, F.R.C.P.

(*Abstract of Paper Read before the Childhood Society, February 27, 1900.*)

EDUCATION requires that the child should be trained as well as taught: training is the work of getting the brain and the body ready to receive instruction and learning, and to a large extent this may be effected before the use of words and a proper understanding of them is acquired. Brain training is of two kinds—(1) mainly affecting the existing natural characters of the nerve-centres, such as their spontaneity of action, which may be controlled and directed to useful purposes; (2) implanting impressions through the senses, thus building up an organisation in the brain leading to co-ordinated action in harmony with the environment. Early education aims at cultivating the power of attention. Observation shows that the healthy young child has much spontaneity of movement, which, even at an early age, may be stopped for a moment when an object is shown or a sound heard, while a little later in development this momentary arrest of fidgeting is followed by co-ordinated action, as the child points to or takes hold of an object. The principal means of controlling the young brain, and producing impressions on it, are through sight and hearing; but besides this, stimulus may reach the brain through the other senses and from the muscles. Muscular sense is so important in the practical work of early training that I must dwell upon the subject. All the movements seen in the body are produced by muscles contracting, and this action in the muscles at the same time sends stimulus up to the brain-centres: movements of the hand, the fingers, the limbs, as well as of the eyes, are produced by muscular action, which at the same time produces an impression on the brain as truly as the sound of words and the sight of objects. Exercises in movements of the hands, fingers, and eyes are most useful in training to appreciate numbers and counting.* Training must proceed stage by stage; each attempt you make should bear on future work. Let the pupil imitate the action of your hand, held out straight with the fingers separated, and move his fingers as you do, one after another, precise in the direction and in the degree of each movement. The sight of each finger moving

* See author's *The Study of Children* (Macmillan and Co.), pp. 207, 124, 179.

impresses his brain; further, an impression is felt of each muscular movement that he makes. Such previous training will be useful when you want to teach the meaning of numbers; the pupil will *feel* that ten movements are greater than two. Muscle sense may be used in another way that is often very useful with dull or backward children. Let the hands be held out, and an ounce weight placed in one, with two ounces in the other hand, each hand being kept open as the weight rests on the fingers, so that the strain on the muscles is felt, not the size of the object. Proportion of weights is thus felt, as apart from dimensions or bulk; further, when you subsequently want weight distinguished from size, or comparisons made as to size and weight respectively, the previous separate impressions received will be useful in giving an understanding of the subject taught. Let him feel the weight by the strain on his hand, then feel the size with his fingers closed around it, while you support his hand so that he does not feel the weight. It is best to produce each class of impressions separately—the feeling of weight, the size, then the colour, etc. Let the child learn to pronounce the name of the object as he looks at teacher's face, then look at the object and name it at sight. Accurate impressions received one at a time enable comparisons to be made later on, but the comparisons must be made among impressions of like class or kind: weight may be compared with weight, or size with size. In comparison or description the impressions received have to be classed as a mental act, therefore each kind of impression should be imparted separately in early training.*

Such early training, stage by stage, prepares the child for more advanced methods of education. Eye movements well under control prepare the way for accurate seeing and reading; they are employed in counting objects, and in adding figures on paper; both hand and eye movements give a means of imparting a knowledge of the use of numbers. Trained muscle sense leads to appreciation of weight and dimensions, their comparison, their proportions, and description; impressions thus made in the brain are retained, and become associated with ideas; and the use of words, standards of weight, measurement, and time must be taught. Training planned so as to produce at first a few impressions of each kind, one at a time, prepares the brain for the exercise of discrimination and choice, or appreciation of agreement and difference in objects around. The teacher should carefully consider some point for comparison—it may be weight, length, size, or colour; each of these characters should have been taught previously by many examples, where each class of sensory impressions has been associated separately with the terms of description.

Retention of the order in which the pupil has made his observations, or the order of events as they occurred, has much to do with his habits of logical thinking and understanding antecedents and sequents, or cause and effect. Associated impressions and their attendant thoughts, when firmly retained, revive in the same relations as a form of self-contained action.

I think we may find a scientific basis of educational methods by first observing children, so as to know the natural characters of healthy brain action, and then patiently attempting to trace out the classes of impressions implanted in the brain, and their interaction in displaying mental ability.

THE ELEMENTS OF SCHOOL HYGIENE.

BY ARTHUR NEWSHOLME, M.D., F.R.C.P. (LOND.),

President of the Incorporated Society of Medical Officers of Health; Examiner in State and Preventive Medicine to the Universities of London and Oxford.

INFECTIOUS DISEASES IN RELATION TO SCHOOL LIFE.

IN last number of THE PRACTICAL TEACHER the dangers of children attending school while suffering from an infectious disease were emphasised. This danger arises from such children attending school (*a*) while suffering from the early symptoms, or (*b*) when convalescent from the disease, but still retaining infection in their person or apparel.

To minimise the dangers under the first of these heads, the symptoms of onset of the chief infectious diseases were described, as by this means the teacher may be enabled to exclude suspicious children. Occasionally the symptoms may not be so characteristic as those described last month. The only safe rule is, when in doubt, act as if the disease were infectious, particularly when it is known that the disease concerning which suspicion has been excited is prevalent. The following summary of these symptoms, which is sent out from the Brighton Public Health Office, with letters to school teachers from my department, gives a useful summary of what has been already said on this subject.

HINTS AS TO INFECTIOUS DISEASES.

"As infection is sometimes spread by means of children attending school while suffering from undetected infectious diseases, the following hints may be useful to the teacher:—

"1. Any scholar having a sore throat should be sent home, and regarded as infectious until the throat has been examined by a doctor.

"If a scholar has enlarged glands in the neck, and especially if he or she is very pallid, the suspicion of possible diphtheria should be entertained. *Many slight cases of diphtheria escape detection.*

"2. Any scholar suffering from a severe cold, with sneezing, redness of the eyes, and running at the nose, should be sent home. It may mean an influenza cold or the commencement of measles, and both are contagious. This recommendation is particularly important when measles is known to be prevalent.

"3. A child with a violent cough, especially if it is severe enough to cause vomiting or nose-bleeding, should be suspected of whooping-cough, and sent home, even if the characteristic 'whoop' is not heard.

"4. Slight cases of scarlet fever sometimes escape notice, and the patients are sent to school with the skin on the hands, etc., freely 'peeling.'

"5. In any of the above instances, or any other case of suspicion, the medical officer of health, on receiving a confidential intimation, will be glad to make an investigation."

Under the Infectious Disease (Notification) Act, the medical officer of health receives information as to all known cases of disease coming within the schedule of the Act, including usually scarlet fever, diphtheria, smallpox, and typhoid fever. Measles and whooping-cough, as well as chicken-pox and mumps, are not in most districts included in the schedule of notifiable diseases. The medical officer of health, on receipt of such a notification, sends an intimation to the head-teacher of the school attended by the patient (if a child), or by any child who is an inmate of the same house as the patient.

The following form is adopted in Brighton:—

"STRICTLY CONFIDENTIAL.

"TOWN HALL, BRIGHTON,
.....18.....

"DEAR.....

.....

of.....is now ill at the Sanatorium, suffering from.....

"He should not be allowed to return to school for..... days, and during the next.....days no other children from the same house should be allowed to attend school.

"Yours very truly,

.....
Medical Officer of Health."

In London it is compulsory on the medical officer of health to supply this information to the teacher; in all well-regulated provincial districts the same practice is adopted.

Duration of Infection.—It is important to know at what period, after the onset of an infectious disease, a child may return to school. This should theoretically coincide with the end of the period of infection; but as it is wise in all cases to allow a margin, we have given the duration of infection, which must be decided in each

* *The Nervous System of the Child* (Macmillan): see "Advancing School Method," chap. viii.

case by a doctor, and the period at which return to school may be allowed, in separate columns in the following table. The significance of the fourth column will be considered later.

It must be clearly borne in mind that the date of cessation of the *patient's* infection is stated in the following table. It is assumed that all wearing apparel has been disinfected, as well as the room occupied by the child. Occasionally a child is taken ill in a particular dress, and is allowed to wear this on returning to school, thus carrying the infection with him.

A scholar who has been suffering from an infectious disease should never be re-admitted to school without a medical certificate of freedom from infection, or an official intimation to the same effect from the medical officer of health. If a doctor's certificate assumes freedom from infection at an earlier period than the one named in Table I., the child should be allowed to attend only after

TABLE I.

Disease.	Duration of Infection.	Date at which School attendance may be resumed.	Duration of Quarantine of children exposed to Infection.
Scarlet Fever.	From 5 to 8 weeks; ceases when all peeling of the skin has been completed, and when the child is free from discharge from the nose or ear or sore places.	Not less than 8 weeks from the beginning of the rash, and then only if he has no sore throat or sore places.	14 days.
Diphtheria.	At least 21 days; often much longer.	Not less than 6 weeks, and not then if strength not recovered, or if any sore throat or any discharge from nose, eyes, ears, etc.	12 days.
Small-pox and Chicken-pox.	About 4 to 5 weeks.	When every scab has fallen off.	18 days.
Measles.	From 3 to 4 weeks, when all cough and branny shedding of skin have ceased.	Not less than 4 weeks from beginning of rash.	21 days.
Rötheln.	From 2 to 3 weeks.	From 3 to 4 weeks from beginning of rash.	21 days.
Mumps.	About 21 days from the beginning.	Four weeks from the beginning.	24 days.
Whooping-cough.	6 weeks from the beginning of whooping, or when the cough has quite ceased.	In about 8 weeks.	21 days.
Typhus and Typhoid Fevers.	4 to 5 weeks.	When sufficiently strong.	28 days.

receiving a second medical certificate, or consultation with the medical officer of health. Some large School Boards now have their own medical officers, to whom such a point would properly be referred.

The admission to school of apparently healthy children from infected houses is strictly forbidden, especially for measles, scarlet fever, and diphtheria, for the following reasons:—(*a*) The children thus attending school may be suffering from an unrecognised attack of the disease, either in the convalescent stage, or suffering from the early symptoms of onset. In either case they may be an active source of infection. Children with mild attacks of scarlet fever and diphtheria frequently attend school after only a few days at home, when they may be stated to have had merely a "bad cold" or an "ordinary sore throat."

(*b*) Such children, although themselves well, may carry infection in their clothes. All infectious diseases may be thus conveyed to others, although the child himself, acting as a vehicle, may remain well. It must be remembered that not every child exposed to infection will develop it. A suitable soil, as well as the specific seed, is necessary, and there is nothing surprising, therefore, in the circumstance that a child may be an active means of infection while remaining himself in good health.

The next question is, How long is the absence of healthy children from an infected house to be maintained? The answer to this question will vary according as the infectious patient has or has not been removed to an isolation hospital. If the patient has been removed to hospital, the house and its infected contents will be disinfected, and the other children in the house may resume school attendance after an interval, which we may describe as the *quarantine period*. If the patient is treated at home, the other children must be kept from school during the whole period of infection *plus* the quarantine period.

The length of the quarantine period depends on the time which each infectious disease requires to develop. After infection is received there follows a *period of incubation*, during which the patient may be in fair health, and does not appear to be a source of infection.

On the other hand, the teacher must never relax rules for particular cases. A fixed time must elapse before return is allowed (see below), and this must be adhered to, even though, in exceptional cases, an earlier return would be unattended with danger.

With the onset of the earliest symptoms he becomes a centre of infection, even before the characteristic rash has appeared in scarlet fever and measles. The period of incubation of the various fevers is shown in the following table:—

TABLE II.

Disease.	Begins usually on the	But may possibly be at any period between
Scarlet Fever	2nd to 4th day.	1 and 7 days.
Diphtheria.....	2nd to 4th ,,	2 and 5 ,,
Small-pox.....	12th ,,	9 and 14 ,,
Chicken-pox.....	14th ,,	10 and 18 ,,
Typhus Fever.....	12th ,,	1 and 21 ,,
Typhoid Fever.....	14th to 21st ,,	1 and 24 ,,
Measles.....	12th to 14th ,,	7 and 18 ,,
Rötheln.....	14th to 18th ,,	8 and 20 ,,
Mumps	19th ,,	14 and 24 ,,
Whooping-cough.....	14th ,,	7 and 14 ,,

In the last column in Table I. it will be noticed that a period of quarantine is given in each case which is somewhat longer than the period of incubation defined in Table II. This is obviously to allow a margin of safety for unforeseen circumstances.

The quarantine period must be assumed to start from the end of the longest possible period of infection of the

last person who has been ill in the house. Thus, referring to the tables, it will be seen that, after scarlet fever, an exposed child must not return to school for 8 *plus* two weeks; after diphtheria, 21 *plus* 12 days; after mumps, 21 *plus* 24 days, etc.

This may seem an unnecessarily long period, but the only way to avoid possible infection is to adhere rigidly to it where children have remained *in the same house* as the infectious patients. Of course, if the healthy children have been removed to another house, or if the patient has been removed to a hospital, and no possible communication is allowed, then only the period of quarantine given in the last column of Table I. need be insisted on.

The question occasionally arises as to whether children of a *second family*, coming from an infected house, may be allowed to attend school. The answer must be that the same rules apply to them as to the brothers and sisters of the patient.

Average Attendance at School in Relation to Preceding Rules.—The teacher of an elementary day school, in which Government grant depends upon average attendance, will not unnaturally look askance at the preceding regulations, especially those restricting the attendance at school of healthy children from infected houses. We have already shown that these regulations are calculated to improve the average attendance, and that the teacher who carries them out most intelligently and strictly will suffer the least from the thinning of his average attendance by infectious diseases. A machinery, however, exists for counting the average attendance of children thus excluded, and this has been freely utilised in Brighton. As this does not appear to be well known by teachers in most parts of the country, I reproduce here my description of the routine adopted in Brighton, from *The British Medical Journal* of September 2, 1899:—

"To meet objections, I have had during the last eighteen months the following plan in operation. The clerk to the School Board has, on my recommendation, supplied each Board school teacher with forms like the following:—

SCHOOL BOARD FOR BRIGHTON AND PRESTON U.D.

Form for Notification of Infectious Diseases to Medical Officer.

(1)	(2)	(3)	(4)	(5)	(6)
Name and Address of Scholar.	Date of last Attendance at School.	Date when reported to M.O.H.	Date when Scholar may return to School.* (*This Column to be filled in by M.O.H.*)	Supposed Nature of Illness.	Inclusive Dates within which Scholar was absent from School on account of Notice of Sanitary Authority. (*This Column to be filled in by M.O.H.*)

* This date is subject to no other case of infectious disease arising in the house.

Signature of Medical Officer of Health .....
.....
.....

Name of School .....
Department .....
Teacher's Signature .....

"The teacher, as soon as he becomes aware of the absence of a scholar on account of what is suspected to be an infectious ailment, sends the form to me with Columns (1), (2), (3), and (5) filled in. This is always done promptly, because the advantage (in average attendance) to the school only commences from the date when the form reaches the medical officer of health. The absentee scholar is then visited, and on the basis of the information thus received the medical officer of health fills in Columns (4) and (6). Chronic contagious complaints like ringworm are not included, but we sign up for mumps and chicken-pox in addition to the compulsorily notifiable diseases. At the end of the school year application is made to the Education Department on Form 101,* the entries in this form being checked from the forms

Fly-leaf to Form 101.*

.....School.
.....County of.....
.....

1. What vacations were allowed during the past School year? (Give exact dates.)
2. During what period or periods was the School closed on account of epidemic sickness or for other causes? (Give exact dates.)

.....

We certify that the children whose names and addresses are entered in Column I. were excluded from School for the reasons and period stated in Columns II. and III.

Signed.....
Correspondent for the School Managers.
.....
Date..... *Principal Teacher.*

I.		II.	III.		IV.
Name of Child.	Address.	Authority for Exclusion on ground of Infectious Disease. †	Period, falling within the School year, during which child has been excluded from attending School. Beginning	Ending	Number of actual meetings of the School during the period specified in Column III. ‡

† Enter in this column *S.A.*, if the child was excluded by Notice of Sanitary Authority; *P.*, if under the requirement of any Act of Parliament; and *M.A.*, if under Medical Advice as to children living in infected houses.

‡ No entry may be made in Column IV. for any period during which the School was closed.

N.B.—The Entries for Boys, Girls, and Infants respectively must be kept distinct, and the sex of the Infants distinguished.

which have been carefully preserved by the teacher during the year. Form 101* is then countersigned by the medical officer of health, who in addition writes a formal certificate to the effect that—

"'The children belonging to —— School, Brighton, who are enumerated in the accompanying list, to each sheet of which I have appended my signature, were excluded from attendance at school by order of the Sanitary Authority of the County Borough of Brighton.'

"During the last school year the Brighton School Board has gained an additional grant amounting to £126, 17s. 9d., in respect of the arrangement just described. As the average attendance in these Board schools was 10,050 in 1898, while the average attendance in voluntary schools in Brighton (in which exactly the same arrangement is at work) was 6,287, it is probable that over £200 has been earned during the year in connection with the above arrangement.

"It should be noted that the medical officer of health signs up not only for absences of patients, but also of all other children from infected houses. This fact secures the co-operation of teachers and school-attendance officers, and relieves the stress of compulsory school attendance, which, however necessary it may be on general grounds, is not infrequently the means of spread of infection."

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Our Monthly Retrospect

EDUCATION IN SCOTLAND.

E.I.S. NOTES, ETC.

BY JAMES PATERSON,

Ex-Vice-President of the Educational Institute of Scotland.

A School Board Chairwoman. THE new School Board of Edinburgh has unanimously elected Miss Flora C. Stevenson to occupy the chair. Miss Stevenson has served on every Board since the passing of the Scottish Education Act in 1872, and has always been recognised as amongst its ablest and most enlightened members. Readers who listened to Miss Stevenson's paper at the recent congress held in Edinburgh will readily agree with the member who proposed her for the chair, that she will fill it "with ability, grace, and dignity." Miss Stevenson is a member of the local branch of the Educational Institute, and a year or two ago was its president. Some years ago she was elected an honorary F.E.I.S., in recognition of her distinguished services to the cause of education.

Glasgow Branch, E.I.S. At a recent meeting of the Glasgow Branch of the Institute, Miss Robb, L.L.A., F.E.I.S., Biggar, read a paper on "Moral Training in the Schoolroom." Miss Robb argued that teachers should share with parents responsibility for the moral training of the children. The main factor in moral training, so far as the schoolroom was concerned, was the teacher's own personality; and moral as well as intellectual education would advance with rapid strides if School Boards were far-seeing enough to pay for thoroughly-trained teachers. These ought to have an ideal before them as to what they shall make of their pupils, and no discouragement should deter them from striving to attain it. Miss Thomson, Gorbals Public School, followed with an interesting paper on "Writing." Reference was made to the departure for service in South Africa of Mr. William Lee, M.A., one of the secretaries of the branch, who is a lieutenant in the Volunteer Medical Staff Corps, and the hope was expressed that he might safely and speedily return.

Honour to Mr. Lobban, H.M. Inspector. The teachers of Banffshire have presented an illuminated address to Mr. Lobban, H.M. Inspector of Schools, on the occasion of his leaving that district for Ayrshire. The address, whilst congratulating Mr. Lobban on his promotion, expresses the regret of the teachers of the district at his removal, and their best wishes for his happiness and success in his new sphere.

Registration. The Scotch Education Department, in a footnote to Article 19 B (1) of the Code for 1900, has granted a concession in regard to registration which will be a considerable saving of time and trouble. In future, scholars who attain the age of seven or ten during the first six months of the year are to be registered as over seven or ten from the beginning of the school year, those who reach these respective ages during the last six months of the year being registered as under these ages during the whole year.

Arbroath Branch, E.I.S. Mr. Blackstock, president of the E.I.S., lately addressed a large meeting of the Arbroath Branch. After dealing with the subject of Superannuation, Mr. Blackstock referred to Lord Balfour's new Bill, which, he considered, constituted a revolution in the country's system of secondary education. He regretted that the proposed executive committee had not the power of dealing with the question of tenure of office. One point, he was certain, would be pressed, and that was, that the whole of the £100,000 should be devoted to secondary education. At present the money was going away in driblets, and in many cases was being wasted. He claimed for the Institute that it had done much in connection with the evolution of this great and statesmanlike measure. It is not generally expected that the Bill will be taken up during the present session.

Renfrewshire Branch, E.I.S. Mr. Charles Black of Mearns Street School, Greenock, read a paper on "Evening Continuation Schools" at the monthly meeting of the Renfrewshire Branch of the E.I.S. Mr. Black advocated a session of at least six months, and recommended that the 17s. 6d. limit should be abolished, as tending to encourage a short session. He urged that all evening-school work, including that of science classes, should be federated. Mr. Black is the head teacher of one of the largest and most successful evening schools in the west of Scotland, and his paper was thoroughly practical and most instructive. Mr. Wood, Nitshill, in commenting upon the paper, told how he made a country evening school successful by selecting music as one of his subjects, and having it well taught.

Kincardine O'Neil Branch, E.I.S. The Kincardine O'Neil Branch of the Institute met the other Saturday in Torphins School—Mr. J. R. Littlejohn, president, in the chair. An address was delivered by Mr. Smith, rector of the Free Church Training College, Aberdeen, on "The Place and Teaching of Modern Languages in Elementary Schools." Having briefly glanced at the olden times when Greek and Latin held sway, Mr. Smith pointed out that nearly nine-tenths of the pupils of the present day went into other than professional life, and that consequently modern languages, from a utilitarian point of view, were of much more value. The lecturer insisted that pupils taking up a modern language should be taught to read, write, and speak it. A paper on "Scottish Song" was afterwards read by Miss Duff, Crathes Public School.

Edinburgh Branch, E.I.S. At the April meeting of the Edinburgh Branch, a paper on "Drawing and Design in Elementary Schools" was contributed by Mr. J. Lessels, teacher of drawing in Leith Academy. The lecturer said the two subjects, the practice of drawing and the habit of design, could go and ought to go hand in hand. A child equipped in the knowledge and language of design would, when he reached the ideal stage, be able to give something like a decent rendering to the idea that might possess him. The address was elaborately illustrated by a series of drawings, in explanation of his definition of design as being simply a matter of filling space. The Branch agreed to recommend Mr. Colin G. Macrae, M.A., the late Chairman of the Edinburgh School Board, to the Board of Examiners for the degree of Honorary F.E.I.S.

Death of Mr. Liddle, Falkirk. Another notable teacher, Mr. George Liddle, parochial schoolmaster of Falkirk for forty years, has just passed away. It is only some four months since Mr. Liddle retired from active duty. He celebrated his jubilee some two and a half years ago, and it is worthy of remark that two of his brothers, members of the same profession, also lived to complete fifty years of service. At that time the money subscribed exceeded by more than a hundred pounds the cost of the silver casket and other articles presented to him, and it was characteristic of the man that Mr. Liddle set aside this sum as a fund to provide annually medals and book prizes for the school children of the town. Mr. Liddle was an exceptionally successful teacher, and was held in high esteem by the public of Falkirk. Some readers may still remember the Merit List of the late Dr. Middleton, H.M. Inspector, which more than thirty years ago appeared from year to year in the Blue-book. In these annual lists, which caused some heartburnings in the central inspectorial district, the Falkirk Parish

MR. LIDDLE.

School always held a foremost place. Mr. Liddle sent out many excellent scholars who now occupy prominent positions in all parts of the world, and many able teachers also received their early training under him, amongst whom may be mentioned Mr. James Milligan, M.A., Rector of the High School for Girls, Glasgow.

NOTES FROM THE NORTH.

Higher Education Bill. As was intimated by Lord Balfour of Burleigh, in the speech he made in the House of Lords when introducing the Higher Education Bill, considerable time is to be given for the discussion of its more important provisions. This promise of sufficient time may, to some extent, account for the very little criticism the Bill has yet received. On the whole, however, the measure has met with considerable acceptance throughout the country. Adverse criticism it has had, but, for the most part, confined to some of the less important points, from an educational point of view at least. Sir James Marwick, the Town Clerk of Glasgow, has submitted a long statement to the Glasgow Corporation Parliamentary Bills Committee with reference to the Bill. In this he points out that in all probability Glasgow Corporation will give its support to the general purposes of the Bill—namely, the promotion of technical and higher education. On the other hand, he thinks that the measure as at present framed will seriously prejudice the interests of the city.

Those interested in agricultural education, while welcoming with gratification the introduction of the Bill, think that provision should be made for the appointment of a Central Committee on Agricultural Education, to advise and assist the Education Department in stimulating, unifying, and directing agricultural education throughout the country. They are also of opinion that the funds required for such should be provided otherwise than by an addition to local rates.

The Educational Institute of Scotland has as yet given no public official pronouncement on the question; but the Higher Education Committee have, we understand, had the Bill under consideration, and are gratified with the statesmanlike efforts being made by Lord Balfour of Burleigh to deal with the intricate and many-sided problem of higher education. The Report of the Institute's Commission on Higher Education, recently published, and referred to in these columns, is getting not a little of the credit in the framing of the Bill. Whether the two are but concomitant circumstances, or the one is the outcome of the other, certain it is that many of the suggestions recommended therein by the Institute's committee have been adopted.

The general feeling of teachers, we take it, is adverse to the clause referring to the dismissal of teachers. It is felt that the provision does not go nearly far enough. In fact, its retention in the Bill, it is argued, may do more harm than good, inasmuch as small School Boards may dismiss teachers in the belief that they are doing less injury to them now, as the Scotch Education Department will issue a certificate of competency. In previous cases School Boards have snapped their fingers at the Department. The clause may be considered a loophole of escape rather than a hindrance to dismissal.

The provision for compulsory evening school attendance will no doubt have far-reaching consequences in the future development of education. It may introduce hardships in some districts; but from an experience gleaned in the centre of a large city, we think it will prove of immense importance, and its effect on the future education of the country is bound to be beneficial.

Is Classical Education doomed? At a meeting of the Glasgow University Council it was agreed to discontinue the junior classes of Latin and Greek. Is this a sign of the times? Is it to be taken as a departure from the time-honoured method of education in which Scotland has stood forth so prominently, or does it indicate a satisfactory advance in the education of the country? It is not so many years since students entered the Scottish universities with barely sufficient Latin to pass a most elementary examination; and as for Greek, we have known students who entered the junior class who hardly knew the Greek alphabet. Many of these students, too, were the future teachers of Scotland. This, therefore, would show that the education of our pupil teachers is progressing along sound lines. It was pointed out by Professor Ramsay that of the Normal students at the university, there were forty-six in the Latin class and only two in the Greek class. The schoolmasters—who, he maintained, were the very class to whom they looked for the teaching of Greek throughout the length and breadth of the country—were shunning the class. This raises a very important question so far as Scotland is concerned. Hitherto there has been no difference of training between a teacher who is to spend his time in an elementary school and one who is to teach in a secondary school. Is this not the thin end of the wedge? Will there not be a tendency to separate the two classes of teachers? For there will still be demanded in the secondary schools of Scotland, for many years, a knowledge of classics.

Leaving Certificate Examination. Circular 286, just received, reminds us that the Leaving Certificate Examinations will begin this year on 20th June. In the course of a few days teachers will be required to fill up Form H (1), stating the exact number of pupils to be examined in the various grades of each subject. The rules of examination are the same as in former years. The presentation of candidates in the same grade a second time is not yet forbidden, but it is deprecated by the Department.

Army Commissions. A very important letter has been sent by Sir Henry Craik to Scottish schools with regard to army commissions. The proposal no doubt is a temporary one, yet it may lead to some modification of the present system. The letter says that Lord Balfour is not prepared to make any nomination except upon adequate proof that the candidate has made good use of his educational opportunities, and that he possesses the intelligence and acquirements necessary for the position. The evils of coaching are indirectly hinted at in the letter, and the chance of proving that better results may be obtained in another way is here given.

It is worthy of note that Sir Henry Craik, as representing the Scotch Education Department, is able to communicate with all the higher schools of Scotland, except perhaps Glenalmond and Loretto, whereas in England such representation was made through the War Office direct.

FOREIGN NOTES.

BY E. E. FOURNIER D'ALBE, B.SC., A.R.C.S.

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THOMAS NELSON AND SONS, 35 and 36 Paternoster Row, London, E.C.

MR. LIDDLE.

School always held a foremost place. Mr. Liddle sent out many excellent scholars who now occupy prominent positions in all parts of the world, and many able teachers also received their early training under him, amongst whom may be mentioned Mr. James Milligan, M.A., Rector of the High School for Girls, Glasgow.

NOTES FROM THE NORTH.

Higher Education Bill. As was intimated by Lord Balfour of Burleigh, in the speech he made in the House of Lords when introducing the Higher Education Bill, considerable time is to be given for the discussion of its more important provisions. This promise of sufficient time may, to some extent, account for the very little criticism the Bill has yet received. On the whole, however, the measure has met with considerable acceptance throughout the country. Adverse criticism it has had, but, for the most part, confined to some of the less important points, from an educational point of view at least. Sir James Marwick, the Town Clerk of Glasgow, has submitted a long statement to the Glasgow Corporation Parliamentary Bills Committee with reference to the Bill. In this he points out that in all probability Glasgow Corporation will give its support to the general purposes of the Bill—namely, the promotion of technical and higher education. On the other hand, he thinks that the measure as at present framed will seriously prejudice the interests of the city.

Those interested in agricultural education, while welcoming with gratification the introduction of the Bill, think that provision should be made for the appointment of a Central Committee on Agricultural Education, to advise and assist the Education Department in stimulating, unifying, and directing agricultural education throughout the country. They are also of opinion that the funds required for such should be provided otherwise than by an addition to local rates.

The Educational Institute of Scotland has as yet given no public official pronouncement on the question; but the Higher Education Committee have, we understand, had the Bill under consideration, and are gratified with the statesmanlike efforts being made by Lord Balfour of Burleigh to deal with the intricate and many-sided problem of higher education. The Report of the Institute's Commission on Higher Education, recently published, and referred to in these columns, is getting not a little of the credit in the framing of the Bill. Whether the two are but concomitant circumstances, or the one is the outcome of the other, certain it is that many of the suggestions recommended therein by the Institute's committee have been adopted.

The general feeling of teachers, we take it, is adverse to the clause referring to the dismissal of teachers. It is felt that the provision does not go nearly far enough. In fact, its retention in the Bill, it is argued, may do more harm than good, inasmuch as small School Boards may dismiss teachers in the belief that they are doing less injury to them now, as the Scotch Education Department will issue a certificate of competency. In previous cases School Boards have snapped their fingers at the Department. The clause may be considered a loophole of escape rather than a hindrance to dismissal.

The provision for compulsory evening school attendance will no doubt have far-reaching consequences in the future development of education. It may introduce hardships in some districts; but from an experience gleaned in the centre of a large city, we think it will prove of immense importance, and its effect on the future education of the country is bound to be beneficial.

Is Classical Education doomed? At a meeting of the Glasgow University Council it was agreed to discontinue the junior classes of Latin and Greek. Is this a sign of the times? Is it to be taken as a departure from the time-honoured method of education in which Scotland has stood forth so prominently, or does it indicate a satisfactory advance in the education of the country? It is not so many years since students entered the Scottish universities with barely sufficient Latin to pass a most elementary examination; and as for Greek, we have known students who entered the junior class who hardly knew the Greek alphabet. Many of these students, too, were the future teachers of Scotland. This, therefore, would show that the education of our pupil teachers is progressing along sound lines. It was pointed out by Professor Ramsay that of the Normal students at the university, there were forty-six in the Latin class and only two in the Greek class. The schoolmasters—who, he maintained, were the very class to whom they looked for the teaching of Greek throughout the length and breadth of the country—were shunning the class. This raises a very important question so far as Scotland is concerned. Hitherto there has been no difference of training between a teacher who is to spend his time in an elementary school and one who is to teach in a secondary school. Is this not the thin end of the wedge? Will there not be a tendency to separate the two classes of teachers? For there will still be demanded in the secondary schools of Scotland, for many years, a knowledge of classics.

Leaving Certificate Examination. Circular 286, just received, reminds us that the Leaving Certificate Examinations will begin this year on 20th June. In the course of a few days teachers will be required to fill up Form H (1), stating the exact number of pupils to be examined in the various grades of each subject. The rules of examination are the same as in former years. The presentation of candidates in the same grade a second time is not yet forbidden, but it is deprecated by the Department.

Army Commissions. A very important letter has been sent by Sir Henry Craik to Scottish schools with regard to army commissions. The proposal no doubt is a temporary one, yet it may lead to some modification of the present system. The letter says that Lord Balfour is not prepared to make any nomination except upon adequate proof that the candidate has made good use of his educational opportunities, and that he possesses the intelligence and acquirements necessary for the position. The evils of coaching are indirectly hinted at in the letter, and the chance of proving that better results may be obtained in another way is here given.

It is worthy of note that Sir Henry Craik, as representing the Scotch Education Department, is able to communicate with all the higher schools of Scotland, except perhaps Glenalmond and Loretto, whereas in England such representation was made through the War Office direct.

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OUR CLASS-ROOM AIDS

NOTES OF A LESSON ON COAL GAS.

By WILLIAM DONE, B.A., *Head-Master of Brighton Pupil Teachers' School.*

Articles of Illustration.—A tobacco-pipe with a long stem, some powdered coal, a piece of indiarubber tubing to connect with the gas-burner, a basin of water to serve as a pneumatic trough, a piece of wire gauze, a soda-water bottle, some wet clay, two gas-cylinders or old glass marmalade-jars.

I. WHAT THE CHILDREN SEE OR HEAR.	II. WHAT THEY INFER.
1. Let the class watch attentively the gas-burner. Turn on the gas. Hold one of the gas-jars over it in an inverted position. Pass the jar round the class for the children to smell. Listen for the noise the rush of gas may make issuing from the jet. Let a child hold his hand just above the unlighted jet. Light the gas.	The gas coming from the pipe— (*a*) Smells strongly. (*b*) Is invisible. (*c*) Can be felt. (*d*) Burns with a bright flame.
2. Fill a gas-cylinder with water, invert it in the water-trough. Fill with coal-gas by bubbling it in from the jet connected with the india-rubber tubing. When the jar is full, cover it firmly with the palm of the hand; withdraw the hand when the jar is in the proper position, and ignite the gas.	(*a*) A jar completely filled with coal gas burns quietly. (*b*) Water allows coal gas to pass through it, and does not apparently soak it up on the way.
3. In a similar manner take the thick soda-water bottle. When inverted in the trough, allow it to half fill itself with air by tilting it a little above the surface of the water. Bubble in coal gas to fill the remainder of the bottle. Cork it up under water. Take the bottle, wrap it in a cloth up to the neck, uncork, apply a light. Refer to the fact that sometimes the gas is left turned on, but not lighted, in a closed room. After a time some one smells the gas, and goes to look for it with a light.	(*a*) A mixture of coal gas and air will explode violently if brought into contact with a light. (*b*) Violent explosions happen in houses sometimes in this way. If we smell gas strongly, we should not go and seek for the place of escape with a light, but open all the windows and doors.
4. Crush the small pieces of coal to powder; fill the bowl of the pipe, and stop it up with clay. If there is a fire in the room, it would be best to insert the bowl in the fire, allowing the long stem to project outside. If there is no fire in the room, the bowl of the pipe must be heated over the bunsen. Let the class note the result. Insert in the steam a piece of cold slate. Let the children see this and smell the deposit on it. After a few minutes, hold a match to the end of the pipe-stem.	The coal being heated in a closed vessel, gave off a brownish smoke at first. This was seen to consist of steam, since it condensed on a piece of cold slate being inserted. The colour was found to be due to a dark, sticky stuff smelling like tar. Finally, we were able to ignite a gas at the end of the stem, which burned like ordinary gas.
5. Refer to any gasworks in the neighbourhood, or sketch the three essential parts of such a manufactory—the retort, the condenser, the holder or gasometer.	From a piece of coal we may therefore obtain— (*a*) Coal gas. (*b*) Water. (*c*) Tar and other matters. The substance left behind in the bowl of the pipe looked and felt like coke, and we know we buy coke at gasworks.
6. Remove the clay covering of the pipe-bowl, and knock out the red-hot coke. Cool this by pouring water on it. Let the children examine it.	
7. Take the piece of wire gauze, and having turned on the gas, before lighting it hold the gauze just above the jet. Now light the gas *above* the gauze.	Coal gas may be burned on one side of a wire gauze without setting fire to the gas on the other side of the gauze.
8. Tell the children that through natural causes accumulations of explosive gases often occur in coal-mines, where, moreover, miners have to work by aid of a light.	This coal gas mixed with air would produce a violent explosion if brought into contact with a light; but if the light were enclosed in wire gauze, the gas would not be ignited outside. (Confirm this inference with a sketch of the Davy lamp.)

Additional information to be made use of at the discretion of the teacher:—

Coal gas itself consists mainly of two distinct gases—light carburetted hydrogen and heavy carburetted hydrogen.

The former one is also called "marsh gas," because produced ordinarily in damp decaying vegetation. It is the gas which is chiefly the cause of explosions in coal-mines, and has the further name of "fire-damp."

The heavy carburetted hydrogen is called also "olefiant gas," and is the more illuminating one. It gives the peculiar smell to coal gas.

Many valuable by-products are also obtained from the distillation of coal, such as aniline, ammonia, naphtha, carbolic acid, and benzene.

Several varieties of coal are in common use. *Authracite* is nearly pure carbon. It is hard and shiny, and burns with little smoke or flame, but with great heat. Hence it is sometimes called "smokeless coal," and is very valuable for locomotives and furnaces generally.

Lignite is a substance intermediate between peat and coal.

Cannel or *gas coal* burns readily, and is much used in gas manufacture.

Household coal, producing both heat and light, is much used for domestic purposes.

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BLACKBOARD ILLUSTRATION.

BY C. ARMSTRONG, EXAMINER TO DEPARTMENT OF SCIENCE AND ART.

BLACKBOARD
SKETCHES ILLUSTRATING
LESSON ON
COAL GAS
Steadying rod
Gasometer lifted out of water by force of gas collected in it.
Steadying wheel
DAVY LAMP
Wire Gauze
Bell of Air Pump
piece of bladder skin tied over jar of gas
effect when air is extracted, shewing
retort full of coal being heated whilst air-tight.
(It therefore cannot ignite, and so
sponges, giving off its gas through A.)
Cold water condenser
clean gas passing
A
coal burning
its gas being in contact with air.
distillation of water, tar, ammonia, &c.

BLACKBOARD DRAWING.

ILLUSTRATIONS FOR LESSONS.

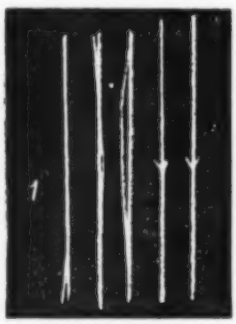
BY EDITH E. BAMFORD, ART TEACHER, EDGE HILL TRAINING COLLEGE.

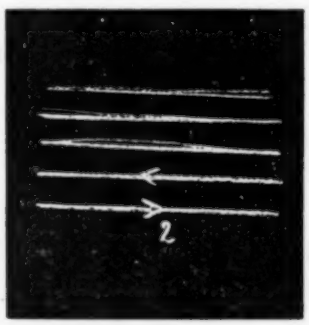
II.

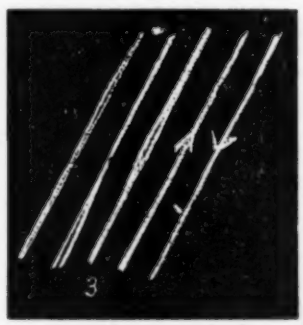
BLACKBOARD exercises are now frequently used as a good means of providing manual training only, not training in drawing. To accomplish this, carefully-graded exercises are practised, and a course systematised for this particular work is followed. The Blackboard Drawing Syllabus of the Science and Art Directory, however, is not drawn up to provide for a course in manual work; its primary object is the training of the teacher to illustrate his lessons. But to do this, a certain amount of manual training is necessary, so that the teacher may have greater freedom and accuracy in making the lines of the illustrations. The subjects selected in these papers are not chosen to improve the manual work of the teacher only, but to form the basis on which he may learn to sketch illustrations for lessons. A few exercises will be described which will give the preliminary manual training required before beginning the illustrations, but the further training will be acquired incidentally whilst making the sketches.

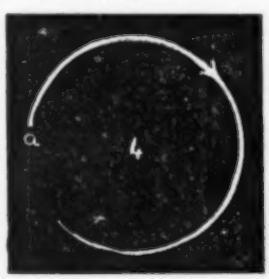
The following are important points to be noted when drawing on the blackboard:—

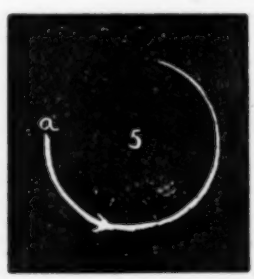
1. The middle of the blackboard should be about on a level with the shoulder, in order that the teacher may reach to about the same distance from the top and bottom of the board and so place his sketch well.

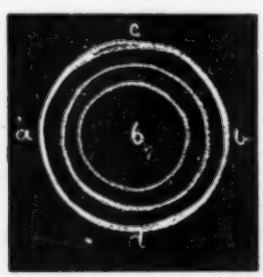












2. Ordinary white or coloured chalk should be used. It is a waste of time to point it, for the point wears off almost immediately; and if a fine line is needed in parts of the sketch, it can generally be obtained from the edge of the flat surface which is made by using the chalk.

3. The teacher should stand opposite the centre of the blackboard, and at easy arm's length from it. Unless the sketch is very large, he should not move to the right or left; neither should he stoop to work at the lower parts, for he should have the whole illustration well in view whilst he is sketching. There is often a tendency to stand near the board: this must be checked, and even the detailed work must be done at arm's length; for the sketch has to be seen from a distance, and a better idea of the effect will be obtained if it is worked from a distance.

4. The judgment of the eye alone should be depended upon for the dimensions in the sketch. If a measure is used in the first exercises, it is depended upon throughout: time is wasted in this way, and one of the chief aims—rapidity of execution—is not achieved.

5. The line should be drawn firmly at once, and not sketched as a faint or dotted line to be strengthened afterwards. If it is sketched boldly, it will probably be correct; at least the bold sketching will be good training towards producing a correct line, for it is the feeble-handed who make both a feeble and a wrong line. If the lines are strong and clear, the impression made on the pupils will also be strong and clear.

6. A line should not be cleaned out because it is wrong in parts, but the teacher should go over it again, correcting the wrong parts. If the line is cleaned out and another sketched in its place, new mistakes will probably be made. Much valuable time is wasted in making diffident attempts, and cleaning them out as soon as they are drawn, and beginning the sketch over again. It is much better to complete the illustration quickly, even though there are gross mistakes in it, than to make long, laborious attempts, if the sketch is only for practice and not for class purposes.

7. The illustration should be lined in if many corrections have been made. It should be lightly rubbed over with the duster, so that only a faint impression is left; and the correct outline should be strengthened with a strong line. If the wrong faint lines are not visible in the distance, they need not be entirely removed. Of course it is better to make correct lines at once, so that there need be no lining in; and this should be one of the aims of the teacher.

8. A blackboard sketch should, as a rule, be an outline sketch only. The blackboard is not suitable for shaded drawings, though good effects can sometimes be obtained, but these depend very largely upon the subject.

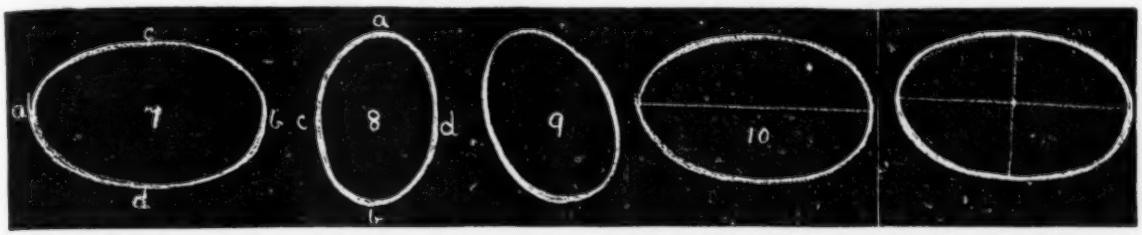
The following are the preliminary exercises which should be practised before proceeding to the freehand drawing and the drawing of objects; they will also be helpful in giving freedom, if practised occasionally during the course:—

The Vertical Line.—The teacher should stand well back from the blackboard, and holding the chalk easily, should draw a strong vertical line with one stroke from the top to the bottom of the board, moving the arm from the shoulder. If the line is badly drawn, he should go over it again, and

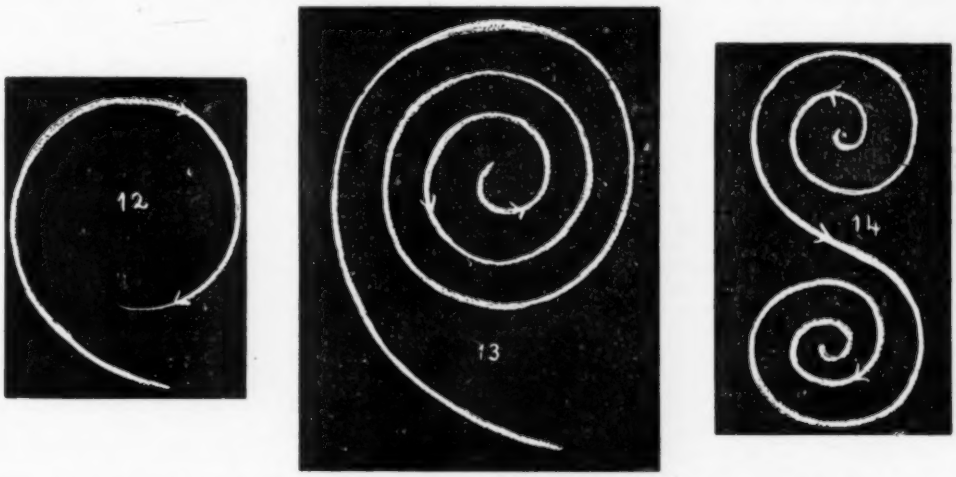
correct it where necessary. A series of such lines, parallel to each other, should be drawn and corrected. (Fig. 1.)

The Horizontal Line.—A series of horizontal lines should be sketched and corrected in the same way as the vertical lines, and worked alternately from left to right and right to left. (Fig. 2.)

The Oblique Line.—Series of oblique, parallel lines, at different inclinations, should be sketched in the same way as the vertical and horizontal lines. (Fig. 3.)



Symmetrical Curves.—A vertical line should be drawn down the centre of the blackboard, and on this a series of symmetrical curves, similar to the leading lines of a design, should be worked. (Fig. 15.) The aim should be to make the curves quite symmetrical, but the work should not be slow and laboured, and faults should be corrected as before, by repeating the line. A great variety of curves can be evolved and practised in this way.



The above exercises are only suggestive. Any lines which present difficulties should be made into exercises, and practised until the difficulties are overcome.

The Circle.—The teacher, still keeping to the original position and moving the arm from the shoulder, should, with one sweep of the chalk, make a circle. Others should be drawn from different starting-points and in the two opposite directions, over the first circle, correcting it where necessary. Thus, starting at *a*, the teacher should work upwards and round to the starting-point (Fig. 4); then downwards, and round again to the starting-point (Fig. 5). This should be repeated several times without cleaning out the circles. The same exercise, working in the two directions, should be made from *b*, then from *c* and *d*. The size should afterwards be varied, large circles about one yard in diameter being made first. (Fig. 6.)

The Ellipse.—This should be worked with the major axis horizontal, then vertically and obliquely; and the exercises should be similar to those described in the circle, four starting-points and two directions being used. (Figs. 7, 8, 9.) The ellipses should be made of different sizes. The major axis should then be drawn horizontally, vertically, and obliquely, and ellipses should be worked on these in the two directions. (Fig. 10.) These axes will give two points through which the ellipses must pass, and greater accuracy will be required. Next, both major and minor axes should be used in the same way; and as four points are thus given, still greater accuracy will be required. (Fig. 11.)

Exercises on the circle and ellipse, similar to those here described, are given in the Alternative Syllabus of Instruction in Drawing in Elementary Day Schools, and are there advocated for practice in free-arm drawing.

The Spiral.—This should be worked without a break, beginning first on the outside and working inwards, then at the inside and working outwards. (Figs. 12, 13.) A modified exercise which involves the two methods of making the spiral should also be practised. (Fig. 14.)

BOTANICAL NOTES FOR TEACHERS.

BY PROFESSOR J. R. GREEN, SC.D., F.R.S.,

Examiner in Botany to the University of London; late Examiner in Botany to the University of Cambridge;

AND F. L. GREEN,

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SCHEDULE A. 5. *Bulb of Tulip.*

TAKE for examination the bulbs of the tulip, hyacinth, daffodil, onion, lily, and compare with them the underground portion of the crocus and the iris.

1. *Tunicated and Scaly Bulbs.*—A bulb may be regarded as (1) a shortened subterranean stem or branch, in the form of a rounded or flattened plate or disc, which bears on its surface a number of fleshy scales; or (2) a subterranean bud of a scaly nature which sends off roots or rootlets from below, and a flowering stem upwards. The tunicated bulb (tulip, hyacinth, daffodil, onion) has a number of inner, thick, fleshy scales which enclose one another in a concentric manner, and are covered externally by thin membranous scales, which form a kind of tunic to them. The fleshy scales are a storehouse of nutriment for the future use of the plant. The scaly or naked bulb (lily) is composed of thick, fleshy, more or less flattened leaves, which simply overlap one another.

2. *Corms.*—The crocus is a corm, not a bulb. It is an enlarged, solid, rounded, subterranean stem, composed of two or more internodes, and covered externally by thin membranous scales. It is the stem in the corm that is large and fleshy, not the scales, which are reduced to thin membranes. It is seen to be a stem by producing from its surface one or more buds or young corms. Food materials are stored up in the stem itself.

3. *Thickened Rhizomes.*—The underground portion of the iris or garden flag is thickened. It is seen to be a stem because it gives off roots from its under surface and buds from its upper surface.

SCHEDULE A. 3. *Cones of Fir Trees, Capsules, Pods, Achenes, Samaras.*

1. *Cones.*—Good examples of cones are found in the spruce fir, Scotch fir or pine, larch, and yew. Compare the male and female cones of the spruce. The male cones are borne in the axils of leaves in last year's twigs, the female cones at the end of last year's twigs. The male cone first produces on its axis a few green reduced leaves, then higher up a number of stamens, each of which bears on its under surface the pollen sacs. The lower scales of the female cone are true leaves; higher up there are small bract scales, in the axils of which arise stout, fleshy, ovuliferous scales which have simply exposed on them two naked ovules. The young cones are red and erect on the branches. They lose their colour later. Pollination is effected by the wind. The scales grow rapidly, and the whole cone increases in size. The seed has a flat plate of tissue which serves as a wing, enabling the seed to float to considerable distances before it reaches the ground. In the pine the male flowers occur in clusters at the base of the shoots, unfolding in the current year. The female cones are similar to, but duller in colour than, those of the spruce. It takes two years to mature their seeds. The yew is dioecious, bearing its male and female flowers on different plants. The male flowers have arranged on an axis flattened scales which bear on their under surface several micro-sporangia or pollen sacs. The female flowers consist of an axis bearing a few pairs of leaves. The single ovule is borne at the end of a short branch, and is enclosed in an integument. This aril or integument grows red and fleshy.

2. *Capsules.*—A capsule is a superior, one or more celled, many-seeded, dry, dehiscent fruit. Good examples may be found in the capsules of the iris, rhododendron, morning-glory, pimpernel, and poppy. The capsules of the iris have loculicidal dehiscence—that is, they split longitudinally, directly along the middle line of the outer wall of one of the loculi (cells) of the capsule, the partitions remaining coherent with the outer walls, and separating from one another at the centre. In the rhododendron we have septicidal dehiscence. The splitting is longitudinal. Each partition, or septum, is split into two thin pieces. The partitions remain adherent to the outer walls, and separate from each other at the centre. The capsules of the morning-glory are an example of what is called septifragal dehiscence. They split longitudinally, directly along the line of the partitions, and the three partitions, or septa, are left standing by the complete falling away of the valves. The capsule of the pimpernel is very interesting. It splits horizontally, and the upper part falls off, leaving the lower part as a sort of cup holding most of the seed. The capsules of the poppy (and snapdragon) dehisce by pores.

3. *Pods.*—Take pods of the pea, bean, and clover. The fruit is formed from a single carpel. There are two well-marked sutures, dorsal and ventral, and the seeds are arranged on the slightly-swollen placenta inside the ventral suture. When ripe, it dehisces by both sutures. Such a superior one-celled fruit is called a legume.

4. *Achenes.*—Compare the fruits of the common avens, clematis, buttercup, rose, strawberry. In all these plants we have superior, one-celled, one-seeded fruits, with a dry, indehiscent pericarp, which is separable from the seed although closely applied to it. In the avens, buttercup, clematis, we have a collection of these fruits arranged on a receptacle, the enlarged top of the flower-stalk. In the strawberry, the much-enlarged receptacle is fleshy red and edible. In the rose hip, the hard, hairy achenes are enclosed within a fleshy receptacle.

5. *Samaras.*—Examples of this kind of fruit are found in the maple, ash, and elm. A samara is a superior two or more celled fruit, each cell being dry, indehiscent, one or few seeded, and having its pericarp extended into a winged expansion. Some botanists call each winged portion a samara. The flattened wings aid in the dispersal of the fruits by the wind.

SCHEDULE A. 4. *Berries of Ivy.*

The fruit of the ivy is called a berry. It originates from a single carpel, is succulent, superior, and indehiscent. The pulp is produced from the placentas, which at first have the seeds attached to them. Later they become separated, and lie loose in the pulp. Many berries—for example, the gooseberry and currant—are syncarpous fruits.

SCHEDULE A. 6. *Bark of Oak, Plane, Birch, Poplar, Robinia.*

1. *How Bark is formed.*—The layer of ground tissue next inside the epidermis is called the cortex. As the stem increases in thickness, great and gradually increasing tension in the cortex is set up, leading to early rupture of the epidermis. To replace the latter, there is a continual formation of layers of phellogen, each of which gives rise to a cork layer externally, and generally to phelloderm, or secondary cortex, internally. The periderm thus formed being impervious to moisture, all the cells external to it dry up and perish. Successive layers of phellogen arise continually deeper and deeper in the cortex. The mass of external tissue thus formed is called the bark.

2. *Uses of Bark.*—(1) Economical; (2) physiological protection of the internal tissues.

3. The whiteness of older portions of the bark of birch is due to the presence of air. On soaking the bark for some time in boiling water the white colour disappears.

Specimens available, but not included in any Schedule.

1. *Mosses.*—Hair moss. Description of the plant. Its place among cryptogams.

2. *Lichens.*—Various forms.

3. *Cuttings of Alder showing Catkins.*—In the male catkins notice the small cymose inflorescences in the axils of the bracts, the two outer and two inner bracteoles, the flowers consisting of four small perianth leaves united at the base, and four stamens opposite the perianth leaves. In the female catkins notice their small size and dark-red colour, the four bracteoles, and the complete absence of a perianth. Each scale bears two flowers. The gynœcium is syncarpous, carpels two. In the fruit the hard scales (bracts) turn black, and persist on the tree after the fruit has fallen out.

4. *Cuttings showing Methods of Branching.*—Lateral branching is to be found in angiosperms. The axis continues to develop in an upward direction by a terminal bud or growing point, and its branches are produced from smaller growing points, originating laterally on the main one. There are two kinds of lateral branching—racemose and cymose. In racemose branching the primary axis continues to develop upwards, and gives off acropetally lateral branches from axillary buds, which also give off lateral branches in a similar manner. Examples may be found in the inflorescence of the flowering currant, wallflower, pear. In cymose branching the lateral axes at an early age develop much more vigorously than the primary axis, and each gives rise to other lateral branches in a similar way. Examples are found in the inflorescences of the chickweed, laurustinus, box. Dichotomous branching occurs in cryptogams. The terminal bud or growing point bifurcates, so that the foot, or podium,

bears two branches arranged in a forked manner. In true, or normal, dichotomy, the two branches continue to develop continuously in a forked manner. In sympodial dichotomy one branch grows much more vigorously than the other, and divides into two.

5. *Sections of Dicotyledonous Stems.*—Plants available are the white dead-nettle (compare Farmer's *Practical Introduction to Botany*, 94–108), geranium (Farmer, 102, 103), sow-thistle (Farmer, 109, 110), elm or oak (Farmer, 112), apple (Farmer, 113–118), sunflower (Setchell, *Laboratory Practice*, 19–21), walnut or butternut (Setchell, 23).

6. *Sections of Monocotyledonous Stems.*—Examples, Indian corn (Setchell, 21, 22; Farmer, 121, 123), oat or wheat (Farmer, 123).

7. *Cuttings of Willow with Catkins.*—Notice the winged seeds. Compare them with the winged fruit (samara) of maple.

8. *Underground Stems and Roots.*—Distinguish between an underground stem and a root. Forms of underground stems—Rhizome (Solomon's seal, fern), tuber (potato), bulb (lily; tulip), corm (cyclamen). Forms of roots—Conical (parsnip, carrot, monkshood), fusiform (radish, beet), napiform (turnip), tubercular (spotted orchis), fasciculated (dahlia), fibrous (grass), adventitious (gooseberry), aërial (ivy). Uses of the stem. Uses of the root.

PRACTICAL ELEMENTARY SCIENCE.

AN EXPERIMENTAL COURSE COVERING THE REQUIREMENTS OF BOTH THE DAY AND EVENING SCHOOL CODES IN PHYSICS AND CHEMISTRY.

BY THOMAS CARTWRIGHT, B.A., B.SC.,

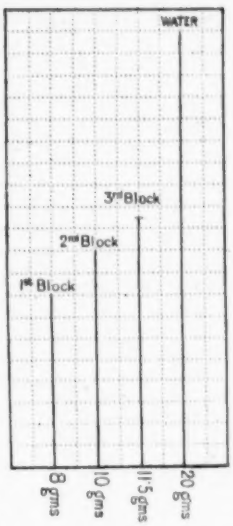
Author of "Practical Chemistry," "'Section One' Physiography," etc.

Relative Density.—This lesson may well begin with the examination by the pupils of two balls, cubes, or cylinders of lead and cork respectively—the aim being to show that the two balls, although of the same volume, are of very different masses or weights. It will not be difficult to make the children admit that there must be more matter in a ball of lead than there is in a ball of cork of the same size. Reference may be made to **crowds** of people which are said to be more or less **dense**, according as there are more or less people in a given area, which will make the class understand why we speak of lead as being denser, or as having a greater density, than cork, and so on: generally, *density is closeness of packing*. The next step will be to provide the pupils with cubes, prisms, or cylinders of different substances, care being taken that the volume is the same in each case. The wood specimens that are sold to demonstrate the various kinds of wood answer admirably for this purpose; but failing these, cubes of the same size may readily be made of different woods. As a preliminary, the volume of each block should be determined, and then the blocks are to be carefully weighed in order to illustrate the above principle—namely, that matter is packed with varying closeness in different substances, or, in other words, that each substance has its own special density. The results obtained may be tabulated as follows:—

Name of Substance.	Volume.	Weight.

But it will be much better to introduce the pupil to the graphic representation of quantities by means of squared paper, the side of each square standing for a given weight. Thus, supposing the weights of the various cubes are 8, 10, and 11·5 grams respectively, the side of a square may stand for a gram, when the graphic representation will be as in next column. The ordinary squared exercise books used for arithmetic will answer very well for this purpose.

It should be kept well in mind that relative density is expressed as a ratio, and so the pupils should be asked how many *times* the various substances are greater in density than any particular one of them taken as a standard. This will lead to the need of a **fixed standard of reference** in respect to density, just as in respect to measurement of length, etc.

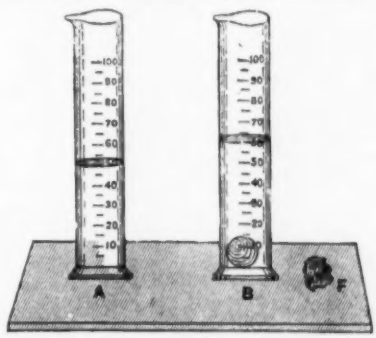


Water the Standard.—The class may be invited to suggest standards, the propriety of which may be usefully discussed from the point of view of variability, the aim being to show the special fitness of pure water. The pupils should now be set to weigh different volumes of water, in order to show that a **cubic centimetre of pure water weighs exactly one gram** at 4° C. Knowing the number of cubic centimetres in the blocks of wood that have been weighed, it will now be possible to make the lines already drawn express graphically the relative densities of the bodies already examined, by drawing a line representing the weight of water occupying the same volume as the blocks in question. Thus, supposing the blocks respectively measured 20 cubic centimetres, the line representing water must be 20 squares in height. It may next be pointed out that our standard should be represented by unity, in order to make matters as simple as possible; and as the weight of a cubic centimetre of water has already been shown to be one gram, it is only necessary to find the number of grams in a cubic centimetre of any substance in order to express its density: hence we may further define density as the **weight of unit volume** or the number of grams in a cubic centimetre. It should now be thoroughly impressed upon the pupil's mind that, in order to find the density of a body, we must know (1) the **exact volume** of a certain specimen, and (2) the **exact weight** in grams of this specimen; and in all that follows we shall chiefly be concerned in describing methods of getting the weight, and, above all, in getting the volume of the substances under examination.

It will be convenient to deal with solids and liquids separately.

Solids: (*a*) **Regular.**—These present no difficulty. Our previous work enables us to get the exact volume, and the weight is a matter of a few minutes' work, so that all that now remains to do is to get the weight of one cubic centimetre by dividing the weight in grams by the volume in cubic centimetres. Cubes, prisms, cylinders of wood, metals, soap, butter, wax, etc., will provide abundant useful work under this head.

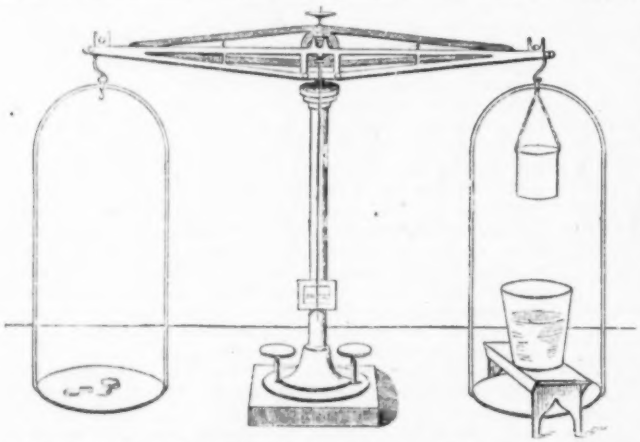
(*b*) **Irregular.**—It will only be necessary to experiment with such solids as are insoluble in water, which may be (1) **heavier** or (2) **lighter** than water. Taking a pebble as an example under (1), its volume may be found by dropping it



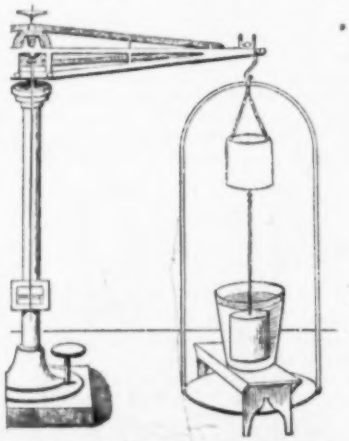
into a measuring cylinder containing water, and noticing the increase in level due to the displacement of water by the pebble, which displacement is, of course, a measure of the required volume. It only remains to weigh the pebble (which,

however, is best done first before immersion), and to divide, as in the former case, to get the desired density in terms of water.

The Principle of Archimedes.—In connection with problems of this description must be introduced the mode of working discovered by the great Greek philosopher Archimedes, whereby both the volume of the solid (and therefore the weight of an equal volume of water) is ascertained, and its weight by simply weighing the body in air and afterwards in water. So much importance and interest attach to this experiment that a special piece of apparatus, called the bucket and cylinder apparatus, has been devised, and is very generally used to demonstrate its truth. A solid cylinder of brass fitting tightly into a hollow cylinder, also of brass, is all that is required, except that handles are supplied to the end, that the apparatus may be suspended from the beam of the balance. Bucket and cylinder are first of all



weighed in air. Next the cylinder is immersed in water, whilst the bucket remains in air, suspended from the beam. There is a loss in weight, which is shown to be equal to the weight of the water displaced by the simple device of filling the bucket with water, whereupon equilibrium is once again restored. The accompanying figures will give all the explanation needed, and it is strongly recommended that every student should carefully work this important experiment, and in addition thoroughly appreciate its full force. The

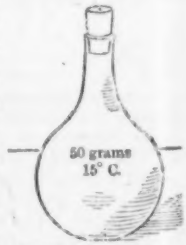


Verification of the Principle of Archimedes.

special point to understand is that the weight in water is less than the weight in air by exactly the weight of the volume of water equal to the volume of the solid; and, allowing one cubic centimetre for each gram, we arrive at the volume of the water displaced, and so at the volume of the solid that displaces it. Hence the rule that the relative density of the solid $= \frac{\text{Weight in air}}{\text{Loss of weight in water}}$, and it should be thoroughly brought home to the pupil how neat a method of obtaining the volume of an irregular solid this really is.

Lighter than Water: Regular; Flotation. — Here, again, is work that will be found of absorbing interest for the inquiring mind. A cube, prism, or cylinder of wood is floated in water, and the part immersed is carefully marked, so that its volume may be accurately determined by measurement. This volume represents the quantity of water equal in weight to the floating body: hence by floating and measuring we get the weight of the body whose volume can be got by measuring; and as we have both the volume and the weight of the solid, it is easy to calculate its density from what has preceded. It must be impressed upon the pupil's mind that a floating body displaces its own weight but not its own volume, whereas a sinking body displaces its own volume and not its own weight, whilst a body the surface of which is level with the surface of the water displaces both its own volume and its own weight—that is, such a body is of the same density as the liquid in which it is just submerged. Many other exercises in flotation may be devised—for example, it may be required to ascertain the density of a liquid such as milk by floating a body first in water and then in milk, and dividing the volume submerged in water by the corresponding volume in milk. A good exercise is to float a lead pencil in a cylinder of water, keeping it upright by means of a piece of cardboard placed over the mouth of a cylinder, and having a hole in its middle through which the pencil is dropped into the water. The volume of the pencil is got by measurement. Its weight is the weight of the column of water that it displaces, which can also be got by measurement, remembering that one cubic centimetre of water weighs a gram. Again, starting with a solid of a known density, we may proceed to determine the density of liquids in which it floats from a consideration of the volume submerged; but such experiments may be postponed to a later course, except in the case of the more advanced students. The same may be said of the problem of determining the density of irregular solids lighter than water or other liquids used, and which have to be submerged by means of a sinker. The student will easily see that the weight of the sinker in water will be less than it would otherwise be, because it is buoyed up not only by the water, but also by the body lighter than water to which it is attached, which, as it floats, will have no weight whatever in water. It will easily be understood that if W = weight of solid in air, W′ = weight of solid and sinker in water, and W″ = weight of sinker in water, then the relative density of the solid $= \frac{W}{W - W' + W''}$. In other words, the weight in air of the body is to be divided by the increased weight of the sinker in water, the increase being due to the enforced submersion of the light body, which is pushed upwards by and in proportion to the volume of water it displaces—that is, in proportion to its own volume.

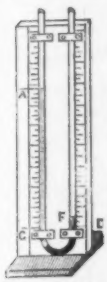
Liquids: Specific Gravity Flask.—If we divide the weight of a given volume of a liquid by the weight of the same volume of water, the result is obviously the density of the liquid in question in relation to water. But as a cubic centimetre of water weighs a gram, there is no need to weigh the water at all, so that all we want is the weight of a known volume of the liquid under consideration. This is got by the aid of a specific gravity flask, which, when the stopper is placed in it, holds exactly 50 cubic centimetres of liquid. The stopper of the flask should be examined by the students, who will readily appreciate the wisdom of the arrangement for speedily filling the flask exactly full. This is simply a perforation through the stopper whereby any excess of the liquid escapes when the stopper is put in. It should also be



Specific Gravity Flask.

pointed out that 50 is a very easy number to divide by. Thus, suppose the flask, full of a certain liquid, weighs 48 grams, then marking off two decimal places to divide by 100, and multiplying by 2 is all that we need do in order to get the quotient of 48 by 50, which equals ·96, which is the specific gravity of the liquid in question.

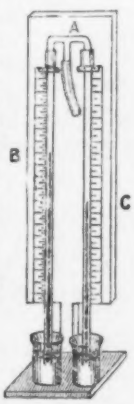
Balancing Columns: the U Tube.—One of the simplest of all density determinations is to get the relation between the densities of two liquids by means of a U tube, which can easily be made by bending a piece of glass tubing of about ¼-inch bore and about 30 inches long in a bat-wing flame. In the case of liquids that do not mix, such as mercury and water, all that is needed is to pour the liquids into the U tube, and to measure the heights above the surface of separation in the two liquids, which will be found to be *inversely as the densities of the liquids.* Thus, if the column of water above the horizontal line of separation of the two liquids is 25 centimetres high, and that of the mercury is 1·84 centimetres high, the density of mercury is $\frac{25}{1{\cdot}84}$ = 13·6. It will be a good exercise for the student to pit as many liquids as possible—such as turpentine, glycerine, methylated spirit, milk, etc.—against mercury, and to determine their densities, taking that of mercury as 13·6.



Specific Gravity by U Tube.

Liquids that mix may be balanced against each other by first of all placing a buffer of mercury between them. The mercury should be brought to the same level in each limb, and all that is to be done is to measure the heights of the columns in each limb above the mercury, which heights are inversely as the densities of the liquids in question.

The inverted U Tube: Hare's Apparatus.—By means of a T-piece, either of glass or of indiarubber, a very instructive piece of apparatus to be used in density determinations may be devised, as will be seen from the accompanying diagram. The open ends of the two limbs are placed in beakers containing the liquids under consideration. The student sucks some of the air out of the apparatus by means of the stem of the T-piece, and the liquids rush up to take the place of the air thus withdrawn, the lighter liquid rising higher than that which is more dense; so that here again the heights are inversely as the densities, and all that is requisite is to carefully measure the heights of the columns in question, one of which may usefully be water, and to divide the water column by the height of the other column.

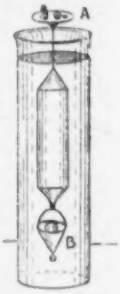


Specific Gravity by Hare's method.

Hydrometers.—Closely connected with the flotation experiments are the experiments with hydrometers, which are simply floating bodies used as indicators of the density of liquids in which they float. If some mercury be placed in a test-tube as ballast until the test-tube floats, the simplest form of hydrometer will be obtained. If the depth to which the tube sinks in water be marked on the tube, and the tube be floated in other liquids, some heavier and others lighter than water, it will be noticed that the tube sinks deeper in the lighter liquids than it did in water, and less deep in the heavier liquids. Again, if the tube is so balanced with different quantities of mercury as to make it sink to the same level in different liquids, and if the weight of the tube is added to weights of the two different quantities of mercury used in the two experiments, these weights are in the same ratio as the densities of the liquids. Thus, if 80 grams and 75 grams respectively are the weights, then 80 : 75 are the ratios between the densities of the liquids under consideration; and if the first is water—namely, that represented by 80—then $\frac{75}{80}$ = ·09375 is the relative density of the liquid in question. The principle of the lactometer may be explained here.

Hydrometer.

Nicholson's Hydrometer is a very popular piece of apparatus, which may be used in the determination of the relative densities of either solids or liquids. It consists of a hollow brass cylinder, carrying scale pans above and below, as may be seen from the accompanying diagram. The central axis that carries the upper scale pan has a mark on it. The hydrometer, when placed in a liquid, floats with the wire axis vertical, and the first thing to do is to ascertain what weight must be placed in the upper scale pan in order that the mark on the wire axis may be exactly level with the surface of the liquid in which the hydrometer floats. This is called the standard weight, and it must be carefully ascertained and noted. Now, suppose we desire to find the specific gravity or relative density of a pebble by means of Nicholson's hydrometer. The pebble is first placed in the upper scale pan, and weights are added until the instrument sinks to the standard point, and the difference between the added weights and the standard weight gives us the weight of the pebble in air. To get its loss of weight in water the pebble is next placed in the lower scale pan B, when, in consequence of the upward pressure of the water, more weights must be added to sink the hydrometer to the standard point, and the difference between these weights is the weight of a volume of water equal to the volume of the pebble; hence its relative density equals the weight of the body divided by the weight of the same volume of air—that is, the first weight divided by the second.



Nicholson's Hydrometer.

To get the relative density of a liquid, the hydrometer, as a whole, must be carefully weighed. The weight needed to sink the instrument to the standard point in water must be carefully noted, and these two weights should be recorded, as they represent the weight of the volume of water that is displaced by the hydrometer when floating in water. The same is done with other liquids, and the relative densities required are got as follows:—

$$\text{Rel. density} = \frac{\text{weight of hydrometer + added weights (in liquid exam.)}}{\text{weight of hydrometer + added weights (in water)}}$$

Brief and imperfect as is this outline of relative density work, it is hoped that enough has been said to show how to give three or four lessons of great practical interest under this head. Of course, it is not necessary that all the class should be at work on the same experiment at the same time. As tubes for balancing columns may most easily be prepared, the bulk of the class may work on them, whilst one or two are engaged with the bucket and cylinder apparatus, with Nicholson's hydrometer, etc., so that all may in turn use each piece of apparatus without unduly increasing the cost by unnecessary multiplication of instruments.

ELEMENTARY LESSONS IN THE PRINCIPLES OF GRAMMAR.

A Course of Forty Oral Lessons for the First Year (New Code, Standard IV.).

BY JOHN R. TIMSON, B.A.

LESSON XXV.

DISTINCTION AND NUMBER.

THERE are two apples upon the table; one is on the book, and the other on the paper. If I desire one of them, no matter which, I say, "Bring me *an* apple from the table." The word "an" means simply "any one." But if I desire a particular one, I use the word "the"—"Bring me *the* apple on the book."

"A," "an," and "the" are called Articles. "A" is used before consonants, "an" before vowels.

"A" and "an" are called Indefinite Articles. "Indefinite"

means "not definite," "not defining which;" but "the" is called a Definite Article. Articles do not form a separate part of speech, but are Distinguishing Adjectives.

We may also show that we distinguish or separate one thing from another by the words "this" and "that"—for example, *this* apple, *that* apple. The distinguishing adjectives "this" and "that" are the only adjectives in English that are inflected or changed to denote number—for example, *these* apples, *those* apples. If you learn Latin or French, you will find that in those languages all adjectives agree in number with the nouns to which they refer; for example,—

Le papier est blanc.
(The paper is white.)
Les papiers sont blancs.
(The papers are white.)

We may also show that we distinguish between two things by using "the one," "the other;" "the former," "the latter."

I saw two boys; *the one* was tall, *the other* was short.

I saw a boy and a girl; *the former* was tall, *the latter* was short.

Those words which indicate the number of things are called Numeral Adjectives—for example, *one* boy, *two* men.

Numbers also indicate order and rank—for example, the *first* boy, the *second* boy.

One, two, three, four, etc., are called cardinal or principal numbers; first, second, third, fourth, etc., are called ordinal numbers.

The repetition of an action is shown by "once," "twice," "thrice." These words are Adverbs—for example, He sang *once*.

For higher numbers we use the noun "times"—as,

He sang three *times*.

Nouns indicating measure, space, and number without a preposition are in the Objective Case—as,

He walked three *miles*.
The fish was three *pounds*.

If we desire to state a number indefinitely, not fixing it exactly, we use Indefinite Numeral Adjectives—as, *some* boys, *few* men, *several* horses, *many* dogs.

Some adverbs denote repetition of action indefinitely—as,

He writes *often*.
They *seldom* play.
We read *frequently*.

The ordinal numbers are often adverbs—as,

He comes *first*.
Tom ran *third*.

Their use indicates whether they are adverbs or adjectives.

The *next* boy.
Next.....Adjective, qualifying "boy."
The boy came *next*.
Next.....Adverb, qualifying "came."

MEMORY NOTES.

The distinguishing adjectives are:—

1. The definite and indefinite articles, "a," "an," "the."
"Some" is used for the plural of "a" or "an."

2. "This," "that," "these," and "those" are the only adjectives in English which are inflected for number in agreement with nouns.

3. Numeral adjectives,—
(*a*) Cardinal: one, two, three.
(*b*) Ordinal: first, second, third.
(*c*) Indefinite: few, many.

The ordinal and indefinite numerals are often adverbs—for example, He sang *first*.

Names denoting measure, space, and number are often used in the objective case without a preposition—for example, He walked three *miles*.

LESSON XXVI.

COMPARISON AND DEGREE.

To patch a coat the tailor selects a piece of cloth of the same colour and texture, and cuts it to fit the hole. In putting two things together to see if they match, we say we *compare* them. To match things together, and to notice in what they agree or in what they differ, is to compare them. This we call "comparison."

Let us take three pencils which differ in length, and then state their difference.

This one is shorter than either of the others; hence it is the shortest.

The words "shorter" and "shortest" express comparison.

Any adjective which denotes a certain quality of anything without comparison is said to be of the Positive Degree—for example, a *black* dog, a *short* pencil.

An adjective used to show more of a certain quality in one thing than in another is said to be of the Comparative Degree—for example, a black*er* dog, a short*er* pencil than the other.

The highest degree of a quality is called the Superlative Degree.

Many adjectives have thus three forms to denote steps or degrees of comparison.

Positive degree—black.
Comparative degree—blacker.
Superlative degree—blackest.

The comparative has the ending "er," and the superlative "est."

Adjectives that form their degrees in other ways are said to be irregular—that is, not keeping to the rule of adding "er" and "est;" for example,—

Good, better, best.
Bad, worse, worst.

Comparison is also shown by the words "more" and "most"—for example, This book is *more* useful than that, but you have the *most* useful of all.

Actions may also be compared—as,

Tom runs *fast*, John runs *faster*, but Harry runs *fastest*.
Rapidly, more rapidly, most rapidly.

The words "more" and "most" are called Adverbs of Degree. Adverbs of degree often qualify adjectives—as,

He is *very* good.
You are *too* lazy.

But adverbs of degree also qualify adverbs—as,

He writes *very* well.

An adverb may be defined as "a word which qualifies a verb, an adjective, or another adverb."

MEMORY NOTES.

Comparison is the matching of two or more things together to note their agreement or difference.

There are three degrees of comparison:—

1. Positive: a fixed quality, not denoting comparison,—
Butter is *good*.
The horse runs *quickly*.

2. Comparative: denoting more of the quality than the positive,—
This butter is *better* than that.
The horse runs *more rapidly* than before.

3. Superlative: indicating the *highest* quality,—
This boy is *best*.
He works *most industriously*.

LESSON XXVII.

ADVERBS AND CONJUNCTIONS.

There are three principal ways of denoting the particular time of an action:—

First, by a single word—as,

He came *yesterday*.
Yesterday.....Adverb, qualifying "came."

Second, by naming a thing that occurred at a fixed time. The name of the thing follows a preposition—as,

He came *after* the *concert*.
After.....Preposition, governing "concert."

Third, by stating another event—as,

Tom came *after Mary left*.

The time of Tom's coming is fixed by Mary's leaving.

"Tom came" is a sentence.
"Mary left" is a sentence.

Words uniting sentences are called Conjunctions. "After" is a conjunction.

The same word may be an adverb, a preposition, or a conjunction, according to its use.

He came *after*.....Adverb.
He came *after* Tom.....Preposition.
He came *after* Tom left...Conjunction.

Similarly, there are three chief ways of indicating place:—

First, by a single word—as,

They ran *along*.
Along.....Adverb, qualifying "ran."

Second, by a preposition and a name—as,

They ran *along* the shore.

Along.....Preposition, governing "shore."

Third, by a conjunction and a sentence—as,

John goes *where* Mary rides.

Where.....Conjunction.

The place of Mary's riding fixes the place of John's going.

The manner of an action and the degree of a quality may also be shown in these three ways:—

First, by an adverb—as,

He runs *fast*.

Second, by a preposition and a name—as,

He runs *with speed*.

Third, by a conjunction and a sentence—as,

I write *as he writes*.

A conjunction which introduces a sentence to fix time, place, or manner, is called an Adverbial Conjunction. These conjunctions must always introduce sentences.

The following are often adverbial conjunctions:—

1. Introducing a sentence to show *Time*—after, before, ere, now, since, till, until, when, while.

2. *Place*—whence, where, whereon, wherever, whither.

3. *Manner* or *Cause*—because, for, lest, since.

One occurrence often depends on another, and the dependence may be expressed by linking two sentences with a conjunction—as,

Tom will buy a bicycle *if* he gets the money.

"If" is a conjunction. Buying the bicycle depends upon getting the money.

One occurrence may prevent another—as,

Tom will buy a bicycle, *unless* he loses his money.

"Unless" is a conjunction. Buying the bicycle will be prevented by losing the money.

The sentence introduced by the conjunction may stand first—as,

If he comes I shall play.

Unless he comes I shall work.

Two occurrences may offer a choice. In this case two conjunctions are used—as,

Either he works *or* he starves.

A choice may be excluded—as,

Neither shall he work *nor* shall he starve.

Conjunctions that are used in pairs in this way are called Alternative Conjunctions. The chief are—either, or; neither, nor; whether, or.

MEMORY NOTES.

Conjunctions are connecting words. They are often used to introduce sentences, and fix time, place, and manner. They are then called adverbial conjunctions.

Adverbs modify verbs, adjectives, or other adverbs.

Prepositions govern nouns or pronouns.

The same word may often be an adverb, a conjunction, or a preposition, according to its use.

Alternative conjunctions offer or exclude a choice. They are—either, or; neither, nor; whether, or.

Never use "or" as an alternative to "neither." To say "neither Tom *or* John" is a serious blunder.

(*To be continued.*)

THE INSPECTOR'S NOTEBOOK.

BY AN INSPECTOR OF SCHOOLS.

THE NEW CODE.

The New Code. No Code within our recollection has been the object of so much attention as the one just issued. The reason of this is mainly to be found in the great changes therein initiated, but partly it is due to the increased general interest taken in education. Writing as I am before the issue of the Instructions to Inspectors, it is somewhat difficult to give the Departmental interpretation of certain portions of the Code. I must deal, therefore, next month with such matters as require the annotation of the Instructions.

* * * * * *

How will it affect the Child? We have been favoured with the views of many people who know practically nothing about education except what transpires at partisan meetings. We have heard much from those who regard primary education as a means to wage war against parsons. The penny-in-the-slot men have carefully calculated the effect upon the rates, even unto the eightieth part of a penny. We can afford to ignore the views of all these pseudo-educationists whilst we calmly consider the probable results upon our daily work. What think those directly interested in the changes—the child, the teacher, and the inspector? The child, the most interested party, by the strange paradox always turning up in these revolutions, has no voice in the matter. With due respect for the duties and responsibilities of the teacher, I claim, as an inspector, to stand as one of the direct representatives of the children. They have my first consideration. The rates, the religious question, and all other outside matters go down before the welfare of the children.

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What Teachers and Inspectors think of it. The opinions of the teacher and the inspector are worth more than those of all others. The teachers in council assembled have pronounced favourably upon the change. I endorse this pronouncement unhesitatingly. We, as inspectors, have been longing for the block-grant system ever since the introduction of intermittent inspection, and we regard such as the natural and necessary corollary of the Article 84 (*b*) method. I am certain, from my experience of the last few years, that the practical abolition of commercialism which has now come to pass will be looked back upon as one of the greatest educational revolutions of the century. The energies, enthusiasm, and very life of the teacher in the past have too often been ear-marked, as it were, not for directing an establishment for training the future citizens of our great empire, but for managing upon successful business lines an emporium for the supply of whatever combination of subjects would prevent the rates of pettifogging School Boards from going up a fraction of a penny.

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Freedom for the Teacher. Chiefly, then, because the changes are bound to make for the good of the scholar, I think the Code should commend itself to all. This end I expect to be compassed by the further freedom given to the teacher. The freer the teacher, as far as routine and schoolcraft go, the better will be the teaching. That is a rule which is none the less sound as a general principle because it needs modification in particular instances. Then, too, the inspector will have more congenial work, although more responsible and difficult. He will be able to devote more time to the encouragement and assistance of the teachers. Not being obliged to assess the value in shillings or sixpences of this or that particular subject, he will be able to obtain a clearer grasp of the school in its entirety. I have said that the inspector's task will be more congenial, albeit more difficult. This must necessarily be so, for he is now perforce brought into closer contact with the school as a living organism. The increased responsibility is apparent, in spite of the fact that it is in future only represented in coin of the realm at twelvepence per head.

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The Schedules of Instruction are gone. We shall scarcely know ourselves without our Codal schemes of work to refer to. The position of head-teacher will, in reference to this, become more onerous and responsible. There will be much thought needed in drawing up schemes of work. This, I take it, will proceed gradually. I shall be prepared to find many teachers continuing broadly upon the old lines in such subjects as arithmetic, for example. On the other hand, I shall not be surprised to find radical changes in the subject known as writing in the old days. Dictation will be superseded, probably, by composition, through which the spelling will be taught. In fact, our notes have practically anticipated the change whereby the subject English is now defined to include "reading, recitation, writing, composition, and grammar in so far as it bears upon the correct use of language."

* * * * * *

This means more ingenuity on the part of the Teacher. In the abolition of the Code schemes we have a revolu-

tion equal in importance to the institution of block grants. The great result will be to produce more skilful teachers, because a successful teacher will be obliged in the future to think much more about his work. That must react upon the child. Teaching will therefore be less mechanical in its results. I advise every teacher to procure a copy of the Code and Instructions to Inspectors, and study carefully those portions which directly affect his or her work. Too many teachers are ill acquainted with the Code.

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The Advantage of the Block System. I will try to clinch the argument that the piecemeal-grant system told against real progress, by referring to what I have met with recently. I have found schools where, in drawing up the time-table, the time given to the subject needlework was either more or less according as the grant per head was one or two shillings. Certain schools originally claimed the two-shilling grant, and then gave plenty of time per week. Subsequently the subject was taught under Article 101 (*c*) for one shilling, and then only half as much time was devoted to the subject. It was with great difficulty that I could convince the teachers concerned that it was hardly possible to dole out needlework in shillings' worths. The teaching of specifics was done upon the same principle. I am heartily glad, for the sake of education generally, to see that the inspector has the power to exclude or include these in the curricula. I have seen too much of these being pushed on the programme merely because they were grant-earning subjects. We had lads struggling with French who knew nothing whatever of the history of England. History, though more serviceable to the child, was not a grant-earning subject, when geography and English were already taken as class subjects.

* * * * * *

A Glance at the New Curriculum. Let us now pass to a general review of the new course of instruction. In later notes I will deal with the subjects in detail. The place of honour is given to English, under its new and wide definition. Grammar is no longer optional. All children must receive a certain amount of instruction in writing and speaking their own language correctly. Beyond this modicum there will be ample room for freedom. Some who set great store on English will drink deep; whilst others will teach the bare minimum, and give more time to subjects they consider more important. In recitation, now, there is no minimum amount prescribed; each teacher will take what amount he considers sufficient, having in mind the circumstances of the school. Dictation and spelling do not actually appear in the list. Spelling will, however, continue to be carefully taught by various methods.

I have been asked by many teachers the exact significance of the "lessons including object lessons on geography, history, and common things." Personally, I fancy this should be liberally interpreted to mean that geography, history, and object lessons must receive attention. Possibly the Instructions to Inspectors will let some light in upon this part of the course. Managers, too, should apply to the Department for sample schemes in this part as well as in other parts of the course. One method I am suggesting for the lower standards is, to take thirty lessons as usual, but twelve on common objects, twelve geographical, and six historical. That would probably suit some schools. There can be no expectation of anything like uniformity, so let us not think of it.

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The Teacher will be largely judged by his Schemes of Instruction. It is evident that in the future syllabus books will have to be more carefully kept. Any teacher who is content with scrappy and illogically-arranged schemes will lay himself open to criticism by an inspector. The teacher will, in short, be very largely judged by the syllabuses, and schemes, and time-tables. I have every reason to expect that the teachers will prove themselves fully equal to the increased responsibilities now imposed upon them.

I shall be happy to receive correspondence upon any subject arising out of these changes. Letters should be addressed—"Inspector," care of the Editor; and should, if a reply is needed, contain a stamped addressed envelope.

NEW ARITHMETICAL PROBLEMS.

BY T. B. ELLERY, F.R.G.S.

Standards II. and III.

The exercises under "B" are more difficult than those under "A;" those under "C" are advanced; those marked "D" are for Standard III. only.

Throughout, the blackboard should be freely used by the teacher. Oral questioning and mental arithmetic practice, *based upon the exercise which is to follow*, will enable the majority of the scholars to attack intelligently even the most difficult of these problems.

Unless this preliminary assistance is given, however, the difficulties presented will probably prove too great for ordinary scholars in these standards.

A

1. Take the sum of a hundred and ten and a thousand and ten from the product of 89 and 99.
2. What must you add to the sum of five thousand and fifty, five hundred and five, and fifty-five to make (98,087 ÷ 11)?
3. A man bought 840 apples on each of 6 days. On each of the first three days he sold 560, and on each of the next three days he sold 900. How many had he then?
4. I have 12 baskets, each containing 4 dozen and 6 eggs. To how many men can I give nine each?
5. A woman bought 126 eggs, and then 54 more. How many dozen did she buy in all?
6. A farmer has five fields, and in each of them there are 88 sheep. How many more must he buy so as to have five hundred sheep in all?
7. What is the difference between the product of 64 and 78, and the product of 85 and 96?
8. A certain school was open 410 times in a year, and one of the boys was absent 18 times, and on 27 other occasions was late. How many times during the year did he receive the "early" mark?
9. In a certain school there were 98 children. Each child received 4 buns, and there were 38 buns to spare. How many buns were there at first?
10. I gave 86 apples to each of 49 men, and had 7½ dozen remaining. How many had I at first?
11. A man saved 54 pennies every day for 96 days. How many shillings did he save? (12 pence = 1 shilling.)
12. In each of 6 bags a man had 137 shillings, and in each of 11 others 194 shillings. How many shillings had he in all?
13. A man earns tenpence an hour. What will be his total earnings (in pence) in eighteen days if he work nine hours a day?
14. A farmer bought cows at £18 each, and horses at £16 each. What did he pay in all for 16 cows and 18 horses?
15. If each of 6 girls and 5 boys receive 96 nuts, how many more than a thousand nuts are given away?
16. A man bought 64 boxes, each containing 180 oranges. On each of nine days he sold 250 oranges. How many had he then?
17. A man spent 6s. 8d. on one day, 7s. 3d. on the next, 6s. 9d. on the next, and 10s. 11d. on the next. How many pence did he spend in all?
18. I bought 420 pears. I kept 186 for myself, and sold the remainder at 3 for a penny. How many pennies did I receive?
19. Take eleven dozen from ten score, and multiply your answer by twelve.
20. (49 × 8) − (675 ÷ 9.)

B

21. John has 96 marbles, and Fred has seven times that number. If they agree to divide the total number equally among 12 boys, how many will each boy receive?
22. A woman bought 128 plums. She used 79, and divided the remainder equally among 4 boys and 3 girls. How many did each girl receive?
23. A man had 164 apples in one bag, 98 in another, and 122 in another. He divided them equally among 4 men, 5 women, and 3 children. How many did each man receive?
24. How many apples do I require to give 36 to each of 24 boys and half that number to each of 38 girls?
25. A man had 32 pennies in one bag, and eight times that number in another bag. There are 12 pence in a shilling. How many shillings had he in all?
26. There are 325 children in a school, and of these 157 are boys. A gentleman gave 2 oranges to each of the boys, and 3 oranges to each of the girls. How many oranges did he give away in all?
27. I have in my pocket 24 sixpenny pieces and 32 shillings.

If I change all this into pence, to how many boys can I give a penny each?

28. I bought 2 dozen eggs at one shop, and 3 dozen at another: 9 of these were stale and were thrown away, and I sold the rest at a penny each. How much less than five shillings did I receive?

29. Add the sum and difference of 284 and 323.

30. A man bought 420 oranges: 280 of these he bought at 2 a penny, and the remainder at 4 a penny. How many pennies did he spend in all?

31. I had 130 eggs in a basket. I sold 4 at each of 16 houses, and 6 at each of 5 houses. How many eggs had I then?

32. What must you multiply 12 by to have the same result as 140×18?

33. Nine boys divided 8s. 3d. equally. How many pennies did each receive?

34. I buy 8 eggs for a shilling. How many do I receive for seven shillings and sixpence?

35. I bought 816 apples at 4 a penny. How many shillings did I spend? (12 pence = 1 shilling.)

36. How many nuts at 8 a penny can I buy with 6s. 7d.?

37. How many eggs can I buy with 8s. 6d., at the rate of 9 for sixpence?

38. I bought 864 pears and put them into 6 boxes and 9 bags. Each box held 96. How many did each bag hold?

39. There were 164 boys and girls in a certain school: 56 saved a penny, 49 saved twopence, and the rest saved threepence. How many pence were saved in all?

40. In the first class in a certain school there were 28 boys, in the second class 29, and in the third class as many as in the first and second classes together. If each boy received two oranges, how many oranges were given away in all?

C

41. I bought nine boxes, each containing seven dozen and six oranges. I kept one-half of the total number bought, and sold the rest at twopence each. How many pence did I receive?

42. There are 640 boys in a school: 386 boys saved twopence each, and the rest threepence each. How many pence did they save in all?

43. I bought 84 apples at 7 a penny, and sold them at 4 a penny. How many pence did I gain?

44. Reckoning 12 inches in a foot, and 3 feet in a yard, how many inches are there in 18 yards?

45. Two horses and four cows cost one hundred and twenty-four pounds. Each horse cost twenty-eight pounds. What did each cow cost?

46. I divided 128 apples between A and B, giving A a dozen more than B. How many did A receive?

47. I had a thousand apples. I sold 18 to each of 7 men, and twice that number to each of 9 other men. The rest I sold to X at 2 for a penny. How many pennies did X pay me?

48. I buy three dozen sheep at 42 shillings each, and sell one-half of them at 45 shillings each, and the rest at 50 shillings each. How many shillings do I gain?

49. A man earns 6s. 4d. a day, and spends 4s. 8d. In how many days will he save half a sovereign?

50. A woman sold 6 baskets of eggs, each basket containing four dozen. At a halfpenny each, how many pence did she receive?

51. How many pennies are there altogether in the sum of 3 half-crowns, 3 florins, 3 shillings, and 3 sixpences?

52. How many books at 2½d. each can you buy with 7s. 6d.?

53. A fruiterer bought 160 apples at 5 a penny, and 240 at 6 a penny. How many shillings did he spend?

54. Frank had 48 marbles, and Harry 36. In the course of a game Harry won 15 from Frank. How many had he then more than Frank?

55. A train runs at the rate of 46 miles an hour. How many miles does it run at this rate between half-past eight in the morning and midday?

56. A man had 256 oranges. He sold 84 to one man, and 95 to another. He placed the remainder in bags, each holding eleven. How many bags did he use?

57. A man writes 25 letters every day, taking one day with another. How many does he write in twelve weeks? (He does not write on Sundays.)

58. I cut each of 48 cakes into four pieces, and gave five pieces to each of 18 men and 14 women. The rest I gave to a number of children, one piece to each. How many children were there?

59. Fred had 86 marbles, and Harry 74. Fred then bought 24 more, and Harry bought 16 more. If each marble is worth a farthing, how many pence are Fred's marbles worth more than Harry's?

60. What is the nearest number greater than 32,816 which is exactly divisible by 11?

D

(For Standard III. only.)

61. A woman earned 8s. 6½d., and her husband twice that sum. If they spent a guinea, how much had they then?

62. A pair of boots cost 11s. 6d., a coat 18s. 9d., and a vest 6s. 6d. What change would the buyer receive from a five-pound note?

63. Three pigs and 4 sheep cost in all £12, 10s. Each pig cost £1, 10s. What did each sheep cost?

64. I had thirty guineas in my purse. After giving £3, 12s. 6d. to my brother, and twice that amount to my sister, what sum had I in my purse?

65. I spent 11s. 6d. in oranges at three a penny. How many oranges did I receive?

66. The divisor of a long division sum is 98, the quotient 175, and the remainder 37. Find the dividend.

67. I had seven half-crowns in my purse, six florins, seven shillings, and seven sixpenny pieces. After paying bills amounting to 8s. 6d., 3s. 9½d., and 9s. 10d., what sum had I remaining?

68. A man's income is two and a half guineas a week. He spends 18s. 10d. in food, etc., 9s. 6d. in rent, etc., and saves the rest. What does he save in a month of 4 weeks?

69. A fruiterer bought 1,664 oranges at the rate of 26 a shilling. What change would he receive from a five-pound note?

70. A man bought 668 eggs, and then 732 more. He paid for them at the rate of 14 a shilling. How many sovereigns did he spend?

71. A gentleman had 186 new sixpenny pieces in a bag, 154 in another bag, and 236 in another. He divided them equally among 18 men and 14 women. How many sixpenny pieces did each woman receive?

72. I buy oranges at 15 for a shilling, and buy in all 7½ dozen. What change shall I receive from a sovereign?

73. There were 380 apples in one bag, 264 in another, 152 in another, and 356 in another. These were equally divided among 27 men, 24 women, and 13 children. How many did each man receive?

74. $(17 \times 17) - (16{,}520 \div 59)$.

75. What number multiplied by 87 gives the same result as 75×290?

76. What number divided by 75 gives the same result as 58×45?

77. In 8 days 18 boys and 27 girls earn 3,240 pence, a girl earning as much as a boy. How much does each boy earn in a day?

78. I bought 180 eggs for half a guinea, and sold one-half at a penny each, and the rest at twopence each. How many pence did I gain?

79. What is the nearest number *less* than 3,275 which is exactly divisible by 56?

80. What is the nearest number *greater* than 3,275 which is exactly divisible by 56?

ANSWERS.

1. 7,691.
2. 3,307.
3. 660 apples.
4. 72 men.
5. 15 dozen.
6. 60 sheep.
7. 3,168.
8. 365 times.
9. 430 buns.
10. 4,304 apples.
11. 432 shillings.
12. 2,956 shillings.
13. 1,620 pence.
14. £576.
15. 56 nuts.
16. 9,270 oranges.
17. 379 pence.
18. 78 pennies.
19. 816.
20. 317.
21. 64 marbles.
22. 7 plums.
23. 32 apples.
24. 1,548 apples.
25. 24 shillings.
26. 818 oranges.
27. 528 boys.
28. 9d.
29. 646.
30. 175 pennies.
31. 36 eggs.
32. 210.
33. 11 pennies.
34. 60 eggs.
35. 17 shillings.
36. 632 nuts.
37. 153 eggs.
38. 32 pears.
39. 331 pence.
40. 228 oranges.
41. 810 pence.
42. 1,534 pence.
43. 9 pennies.
44. 648 inches.
45. Seventeen pounds.
46. 70 apples.
47. 275 pennies.
48. 198 shillings.
49. 6 days.
50. 144 pence.
51. 216 pennies.
52. 36 books.
53. 6 shillings.
54. 18 marbles.
55. 161 miles.
56. 7 bags.
57. 1,800 letters.
58. 32 children.
59. 5d.
60. 32,824.
61. 4s. 7½d.
62. £3, 3s. 3d.
63. £2.
64. £20, 12s. 6d.
65. 414 oranges.
66. 17,187.
67. 17s. 10½d.
68. £4, 16s. 8d.
69. £1, 16s.
70. 5 sovereigns.
71. 18 sixpenny pieces.
72. 14s.
73. 18 apples.
74. 9.
75. 250.
76. 195,750.
77. 9 pence.
78. 144 pence.
79. 3,248.
80. 3,304.

OUR TUTORIAL SECTION

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

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SPRING EXAMINATION, 1901.

First Month.

THIS month we start a new course for next year's examination. To those who propose to follow this course, it may be well to point out how the greatest advantage may be derived from it. Many pupil teachers in country districts have not the opportunity to attend central classes, and frequently have but little assistance in the preparation of their work. For such students these columns are mainly intended. The work is divided into monthly portions, and test questions are given on the work of the preceding month. Attention is directed to the chief points, and notes elucidating or adding to the information in the usual text-books are supplied as far as space will permit. Advice is given on the choice of text-books, or on any other subject where a difficulty presents itself. Specimen answers are marked and criticised gratis, and every endeavour is made to be of real service to hard-working individual students.

The syllabus of work set for 1901 is exactly the same as that given for last year. This will be found detailed in Schedule 5 of the new Code.

Work for the Month.

1. Repetition.

Ten or twelve lines should be learned per week, and continued practice is needed, for mere verbal repetition without due attention to modulation and emphasis is worth little.

The following passages are recommended :—

Candidates.—Marmion, Canto vi., lines 735–870.

First Year.—The Traveller, starting at line 50.

Second Year.—Julius Cæsar, Act i., Scene 2—

"Will you go see the order of the course.....

Have struck but thus much show of fire from Brutus;"

or Mark Antony's oration, Act iii., Scene 2; or Act iv., Scene 3, lines 1–120.

In addition, any passages of particular merit should be committed to memory.

2. Reading.

This is a subject which must be attended to. A few minutes' *oral* practice before a competent critic should be taken daily. Before commencing the special book set, all pupil teachers are earnestly advised to read very carefully the circular of the Department on this topic.

The special books are—

Candidates.—The Talisman (Blackie's School and Home Library).

First Year.—Southey's *Life of Nelson* (Macmillan).

Second Year.—Frederick the Great (Macmillan).

3. English.

Candidates.—Before commencing the study of the poem in detail, a summary of the preceding cantos, or, better still, the cantos themselves, should be read, or it will be found impossible to understand the allusions and general run of the tale.

For this month prepare thoroughly lines 1–130.

First Year.—Prepare lines 1–50, *The Traveller*.

Learn the meanings of all allusions, the derivations of all important words, or, in place of the latter, twenty roots and meanings from a good list.

Second Year.—Julius Cæsar. Prepare Act i., Scenes 1 and 2, to line 214—

"And tell me truly what thou thinkst of him."

Candidates and First Years should analyse and parse the whole of the poems set; Second Years, all the more important passages. If any difficulty or doubt is experienced, the student should write for assistance.

N.B.—As very full notes on the poems were given last year, it will not be necessary (unless a majority desire it) to reproduce them. For notes on the month's work see THE PRACTICAL TEACHER for May 1899.

4. Essay Writing.

This is the subject which will require *most* attention. Composition is rarely a strong point with junior teachers, and as all the examinations are written, it seriously affects all subjects. I am often asked the question, "How can I improve my composition?" There is no particular rule to be learned, no specific and sudden cure for a bad or weak style. The secret of good composition lies in two facts—first, a thorough knowledge of the subject; and second, the power to express ideas in good, correct, and vigorous language. The only way to attain both of these requirements is to read widely, wisely, and thoughtfully. We become unconscious imitators of the authors we read; their words, phrases, and turns of sentences are remembered when the book as a whole is forgotten; and though every one develops a particular style of his own, this is moulded and determined to a great extent by general reading. Hence the pupil teacher should always have some good English classic with which to pass away the idle moments which come daily, reading and thinking over what is read, so that the information may be absorbed entirely. If this is done, ability to write easily and sensibly on general topics will result.

Of the books dealing with the technical part of composition Meiklejohn's *Art of Writing English* (A. M. Holden) is the best, and the little book, *One Hundred Essays in Outline*, by the same writer, affords excellent models of arrangement and classification of facts.

An essay should be sent up occasionally for criticism. The following subjects are suitable for practice:—Spring, Flowers, Domestic Animals, A Country Walk, An Old Farmhouse, Your Native Town or Village.

A prize of five shillings will be given for the best word picture of the home (town, village, etc.) of the candidate. Lists of buildings, streets, etc., are not required. Imagine yourself standing on some elevation, and describe exactly what you would see. Due regard will be paid to the "year" of the candidate, which, with name and address, must be written at the head of the paper. The description should not exceed thirty lines.

5. History.

Candidates.—Prepare from the Roman invasion to the Norman conquest.

A very useful book for the use of Candidates is Macmillan's *Outlines of English History*, by A. M. Buckley. This, with *A Synopsis of English History*, by Wills (Blackie and Son), will be quite sufficient.

The dates of all the leading events must be learned. A note-book must be kept in which to enter summaries.

First Year.—Prepare from Alfred to 1066.

Chief Points:—The difficulties of the early years of the reign; the defeat of the Danes, and their settlement by the treaty of Wedmore; Alfred's claim to the title of "Great;" reforms in the army; finance, law, education; the creation of the navy.

Dunstan, the first of the series of great English churchmen, and the events connected with his life.

The third Danish invasion—its causes and results.

Edward the Confessor—his connection with Normandy, and the results which this had on subsequent events.

Earl Godwin and his sons.

Saxon life and institutions; the Witan and smaller "moots;" system of land tenure; personal character, etc.

Second Year.—James I.

Prepare and learn a genealogical table showing the descent of the Tudors and Stuarts from Henry the Seventh. Learn the

causes of the various plots—Main, Bye, and Gunpowder; the Millenary Petition and the Hampton Court Conference; the authorised version of the Bible.

The growth of the Puritans as a religious and political party.

The Stuart theory of divine right of kings—passive obedience, the power of dispensing with laws.

James's favourites.

N.B.—Endeavour in preparing the history to acquire a definite knowledge of positive facts. The greatest defect in the answers to this subject is always the haziness of ideas shown. Do not attempt to read too much; a little thoroughly known is better than much that is confused.

6. Geography.

Candidates.—Chief physical features of the globe. Take one continent each week. Prepare an outline map, and insert the names which you wish to remember, and go over them till thoroughly known.

First Year.—Europe generally. Position, extent, physical features, climate, productions, and peoples. Draw maps for everything.

Second Year.—Africa generally. Morocco, Algeria, Tunis, Tripoli, and Egypt in detail. Draw maps for each country.

The reasons for the British occupation of Egypt should be carefully noted, and also the very remarkable results which have accrued from it.

7. Arithmetic.

Candidates.—Simple practice and the theory of aliquot parts.

Note that an aliquot part is a quantity which is contained in another an exact number of times. This is fully dealt with in Christian and Collar's *Arithmetic*, which every pupil teacher should use.

First Year.—Vulgar fractions. Theory and definitions of various kinds: addition, subtraction, multiplication, division; and compound and complex fractions.

What is wrong in the following definition:—"The denominator denotes the number of parts into which the whole is divided"?

How would you show that the difference between two proper fractions must be less than unity?

How would you show by diagrams the truth of the rules for the simple operations with fractions?

Why, when dividing by a fraction, is the quotient greater than the dividend?

Write down a fraction which is midway between $\frac{13}{17}$ and $\frac{15}{19}$.

Second Year.—Simple proportion. Read up the theory very carefully, and be prepared to work by method of unity or proportion.

Learn:—Ratio is the relation existing between two quantities of the same kind with regard to magnitude.

Proportion is the equality of two ratios.

What is meant by extremes and means?

What is wrong in this proportion—

As 5 books : 10 books :: 5s. to 10.

Is it necessary that the unknown term in a proportion should be in the fourth place?

As A : B :: C : D. Write down all the equations which you can educe from this.

Define and give examples of compound ratio, duplicate ratio, direct and inverse ratio.

What is a mean proportional?

8. Euclid and Algebra.

First Year.—Euclid: definitions, axioms, and postulates. Algebra: meaning of terms, substitution of numerical values.

Second Year.—Euclid: Props. 26–30, with four deductions per week. Algebra: G.C.M. (to be worked entirely by factors).

9. Music.

Candidates.—The major scale—its structure and intervals.

First Year.—First removes of key.

Second Year.—The minor scale—its structure, and relation to the major.

10. Teaching.

Practise writing on the blackboard, *after* writing the same letters on paper. (Use *The Practical Teacher Copy Book.*)

No test questions will be set this month. All students are cordially invited to write for any assistance or advice they may require. Queries should be written on foolscap paper, with space allowed for the answer to be written.

AUTUMN EXAMINATION, 1900.

Eighth Month—May.

Work to be Prepared.

1. Reading and Repetition.

Continued oral practice. Students who are weak in this subject will find considerable assistance from Forsyth's *Practical Elocutionist* (Blackie).

2. English.

Candidates.—*Marmion*, Canto vi., lines 798 to 901.

First Year.—*The Traveller*, lines 335 to 376. Twenty roots and meanings. Derivation of all important words in the passage set for preparation.

Second Year.—*Julius Cæsar*, Act iv., Scene 3, line 121, to end of Act iv. For *Notes*, etc., see December number.

(All pupil teachers should procure at once "The Practical Teacher English Notebook"—indispensable for all.)

3. Essays.

Write one or two essays each week, selecting from the following:—Our Food Supply; Autumn; The Effects of a Storm; Describe some incident of which you have heard and read (give as graphic an account as you can); The Losses of the Blind; The Character of Alfred the Great.

4. History.

Candidates.—William and Mary, Anne, George I. and George II.

First Year.—Henry VII.

Second Year.—George III. to 1800. (See *Notes* below.)

5. Geography.

Candidates.—Scotland—counties and towns, government, etc.

First Year.—Arabia, Persia, Asia Minor, Afghanistan.

Second Year.—South America.

6. Arithmetic.

Candidates.—General practice on the year's work.

First Year.—Profit and loss.

Second Year.—Mensuration of rectangular areas.

7. Euclid.

First Year.—Props. 25 and 26, and four deductions each week.

Second Year.—Revise Props. 13–16, with eight deductions per week.

8. Algebra.

First Year.—Addition and subtraction of fractions involving the use of G.C.M. and L.C.M.

Second Year.—Problems on quadratics.

Notes on the Work for the Month.

1. History.

Candidates.—In the period for this month note very carefully the Bill of Rights—the definite settlement of questions which had agitated English minds for centuries; the reduction of Ireland and Scotland. The new laws—Triennial Bill, Mutiny Act, Toleration Act, etc.—are all important. Note how William's Continental connection drew England more intimately into the arena of European politics; William's scheme to check the growing power of Louis the Fourteenth.

In Anne's reign the chief interest centres in Marlborough and his campaigns. The Legislative Union with Scotland is an important step in our history.

George the First. Prepare a table showing descent. Note "the '15," Septennial Act, the South Sea Scheme. In George the Second's reign, Walpole's administration at home (learn a life of Walpole). The War of the Austrian Succession; "the '45," which was indirectly connected with it. The Seven Years' War: the foundation of our Indian Empire, and the acquisition of Canada. Learn lives of Clive, Wolfe, and Pitt.

First Year.—In Henry the Seventh's reign, which may be said to commence modern history, there are many important features. The downfall of the Feudal System left the king nearly absolute, and inaugurated the period of rule by mental superiority rather than by physical force. Henry the Seventh was avaricious—note the means of acquiring money: confiscation of the Yorkist property, by Star Chamber, by Empson and Dudley, by Cardinal Morton, by grants from Parliament for war, and by bribes from France to abstain. Note the plots, and how they failed. The marriage of Prince Arthur, and afterwards Henry, to Catherine of Aragon, helped on the Reformation; the

marriage of Margaret with James the Fourth of Scotland brought ultimately the Stuarts to the English throne.

Second Year.—The finish of the Seven Years' War resulted everywhere in gain for England. The suicidal and selfish commercial policy towards the American colonies led to their loss. The causes of the French Revolution, and the incidents connected with it and arising from it, should be studied. The Gordon Riots of 1780 give a glimpse of the intolerant ignorance of the times.

2. Geography.

There are no particular points which need special note, except that second year pupil teachers should note that the dispute with Venezuela has been settled by arbitration, the award of the court being a compromise, largely in favour of England. Though we have had to cede some valleys, the majority of the land claimed by us west of the Essequibo still remains under our jurisdiction.

"I am very weak in geography," writes a student; "how can I improve?" Weakness in geography inevitably arises from two great mistakes—(1) from trying to learn the subject by *reading* only, when the visual memory should be utilised by maps, diagrams, plans, and tables; and (2) by leaving one set of facts before they are thoroughly known, to proceed to others. Take a small book and learn that thoroughly; afterwards fill up from a larger book. Take a regular portion each week, and do it thoroughly. Haziness of ideas in geography means utter failure.

3. A few Model Solutions in Arithmetic.

(1.) The fraction $\frac{1}{120}$ is intermediate in value to two consecutive figures of ·1234. Find which are these figures, which of the two is nearer to $\frac{1}{120}$, and by how much expressed decimally.

The four figures = $\frac{1}{10}$, $\frac{2}{100}$ or $\frac{1}{50}$, $\frac{3}{1000}$ or $\frac{1}{333\frac{1}{3}}$, $\frac{4}{10000}$ or $\frac{1}{2500}$.

It is evident that $\frac{1}{120}$ lies between $\frac{1}{50}$ and $\frac{1}{333\frac{1}{3}}$, or 2 and 3.

$\frac{1}{50} = \cdot 2$
$\frac{1}{120} = \cdot 008\dot{3}\dot{3}$
$\frac{3}{1000} = \cdot 003$

The difference between the first two = $\cdot 191\dot{6}$.
" " second two = $\cdot 005\dot{3}$.

Therefore $\frac{1}{120}$ lies nearer to ·003 than ·02; and by the difference between $\cdot 191\dot{6}$ and $\cdot 005\dot{3} = \underline{\cdot 186\dot{3}}$. Ans.

(2.) By how much does the G.C.M. of $7 \times 12 \times 19 \times 101$ and $7 \times 17 \times 19 \times 101$ exceed the G.C.M. of $7 \times 12 \times 19 \times 101$; $7 \times 17 \times 19 \times 101$; and $12 \times 17 \times 101$?

The first G.C.M. $= 7 \times 19 \times 101$.
The second G.C.M. $= 101$.
Difference $= (7 \times 19 \times 101) - (101)$, or $101\ (7 \times 19 - 1)$, that is, $\underline{101 \times 132}$. Ans.

(3.) The sum of £17,100, 0s. 9d. is to be shared among 19 people, each of whom is to be paid in coin. After as much money as possible has been shared equally among all, the rest is to be shared equally among as many as possible of the 19. How many of the 19 will receive less than others?

By inspection, each will receive £900, leaving 9d. to be further divided. This will give ¼d. each, and then ¼d. to 17, leaving 2 with ¼d. less than the others.

(4.) A watch gains 10 minutes a day. It is right at noon today: what will be the true time when the watch next indicates 12 o'clock?

It will indicate 12 at midnight.

24 hrs. correct time = 24 hrs. 10 min. watch time.
Then $24\frac{1}{6}$ hrs. watch time = 24 hrs. correct time.

1 " " " $= \frac{24}{24\frac{1}{6}}$ " "

12 " " " $= \frac{24 \times 12}{24\frac{1}{6}}$ " "

$= \frac{24}{1} \times \frac{12}{1} \times \frac{6}{145}$

hrs. min. sec.
$= \underline{11 \quad 55 \quad 2\frac{2}{29}}$. Ans.

(5.) A and B invested each the same amount, A in 5 per cents. at 120, and B in 4 per cents. at 80. At 1s. in the £, the total income-tax on their receipts was £5, 14s. 7d. How much income-tax did each pay, and what sum did each invest?

Suppose each had £480. Then A gets £20 income, B " £24 " } = £44.
The tax on £44 at 1s. = 44s. = £2, 4s.
But £2, 4s. = $2\frac{2}{11}$ of the amount given.
Therefore £480 = $2\frac{2}{11}$ of the real sum, which = £1250 each.
The £5, 14s. 7d. was divided as their incomes 5 : 6.
A pays $\frac{5}{11}$ of £5, 14s. 7d. = £2, 12s. 1d.
B " $\frac{6}{11}$ of £5, 14s. 7d. = £3, 2s. 6d. } Ans.

(6.) A boy spent $\frac{1}{17}$ of his money. Then he spent $\frac{1}{12}$ of the remainder. He had now spent 2s. 0½d. less than was left. How much had he spent?

If original money = 1. He spent $\frac{1}{17}$, and had $\frac{16}{17}$ left. He spent $\frac{1}{12}$ of $\frac{16}{17}$, and had left $\frac{11}{12}$ of $\frac{11}{12} = \frac{121}{144}$. The difference between what was spent and what was left $= \frac{121}{144} - \frac{23}{144} = \frac{98}{144}$.

Then $\frac{98}{144}$ of his money = 2s. 0½d.
$\frac{1}{144}$ " " = ¼d.
$\frac{144}{144}$ " " = 3s. Ans. 3s.

Test Questions.

1. *Penmanship.*

Large Hand:—*Presbyterian.*
Small Hand:—*She that with poetry is won*
Is but a desk to write upon.

2. *English.*

Candidates.—Analyse and parse words in italics:—

"But *if* we *conquer*, cruel maid,
My spoils shall at your feet *be laid*
When here we meet *again*."

First Year.—(*a*) Paraphrase lines 297–309.

(*b*) Analyse:—"Thus while around.....
.....are here displayed."

(*c*) Parse:—*while, around, hence, opulence, brings.*

Second Year.—(*a*) Paraphrase:—
"You have done that.....
.....dash him to pieces."

(*b*) Analyse the first six lines of the same piece.

(*c*) Parse:—"A flatterer's would not, though they do appear
As huge as high Olympus."

3. *Geography.*

Candidates.—Write a description of the Hebrides, and say something, if you can, of the people and their occupations.

First Year.—How is China governed? What European nations have obtained a footing there? In what places?

Second Year.—Mention twelve large towns in the United States, and say what is the leading industry connected with each.

4. *History.*

Candidates.—Explain the causes that led to the Civil War in England. Why were the Stuarts restored?

First Year.—Write a life of Warwick the king-maker, and explain what part he took in the Wars of the Roses.

Second Year.—What do you understand by the Reform of the Calendar? Why was it necessary, and what important changes were made?

5. *Music.*

Candidates.—(1.) What other groups of contiguous scale-tones are separated by the same intervals as

f m r d ‖ l s f m ‖ s f m r ‖

(2.) Name the following intervals:—

t_1-f, m-d^1, s_1-f, m-l, f-d^1.

(3.) Write over each note and rest its value in pulses or fractions of a pulse—

| d.t, : d : m | s : -.l : s | f : - : - | m : -.r : d ‖

First Year.—(1.) Rewrite the following passage, making a change to the first sharp key at (*a*), and a return to the original key at (*b*) :—

Key C. (*a*) (*b*)

d s m r fe l s d¹ t s fe l s m l s t d¹

(2.) Write the following intervals :—

Minor sixth above **ray**; augmented (or pluperfect) fourth below **me**; perfect fifth above **te**$_1$; minor seventh above **doh**; minor third above **soh.**

(3.) Rewrite the following in four-pulse measure, doubling the value of each note and rest :—

| m . f : s . | f . , m : r | d . d , r : m . , f : s | l$_1$. t$_1$: d ‖

Second Year.—(1.) Name the intervals formed by each of the following notes with the others :—**r f se d¹.**

(2.) Write out the following in four-pulse measure :—

$1\frac{1}{2}$ $1\frac{3}{4}$ $\frac{1}{4}$ $\frac{1}{2}$ $\frac{1}{2}$ 2 $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ 1 2 $\frac{3}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ 1 $\frac{3}{4}$ $\frac{1}{4}$ $\frac{1}{2}$ $\frac{1}{2}$ 1

s l s f r rest s d¹ t l s r m r f m r s f m r m d

(3.) Explain (briefly) the meanings of the following musical terms :—Forte, Legato, M. 60, Adagio, Da Capo.

SCHOLARSHIP EXAMINATION, 1900.

Fifth Month—May.

WORK TO BE PREPARED.

1. *Reading, Repetition, and Penmanship.*—A few minutes' practice daily.

2. *Theory of Teaching.*—Chaps. vii. and viii., *Scholarship School Management.*

3. *Geography.*

(1.) Revise Asia (Asia Minor, Persia, Arabia, Afghanistan, Beluchistan, and Turkestan).

(2.) Prepare fully New Zealand with a memory map.

4. *History.*—The Tudors. 1485–1603.

5. *Composition.*—One or two essays each week on such subjects as—The Solar System, The Dignity of Labour, The Character of Frederick the Great, The Development of Australia, Joan of Arc, The Rise of the Drama, The Character of Brutus.

6. *English.*

(1.) The grammar and syntax of the adverb.

(2.) Twenty roots and meanings each week.

(3.) The history of the language, 1700 to 1750.

(4.) *Julius Cæsar*, Act iii., Scenes 2 and 3.

7. *Arithmetic.*—Profit and loss.

8. *Algebra.*—Problems on quadratic equations.

9. *Euclid.*—Book I., Props. 41–48, with six deductions per week.

10. *Elementary Science.*—Terrestrial magnetism: properties of the loadstone and artificial magnets; the earth as a magnet; primary laws of magnetic attraction and repulsion; dip; the earth's magnetic poles.

11. *Languages.*

Latin, *Pliny's Letters*, No. 6. } Translation and retranslation.
French, *Le Trésor*, three pages. } Exercises in grammar.

12. *Drawing.*—A freehand copy each week. Geometry: the ellipse.

13. *Music.*—Chap. v., *School Music Teacher.*

14. *Domestic Economy.*—Rules for warming, cleaning, and ventilating the dwelling.

Notes on the Work for the Month.

1. *Geography.*—Maps must be drawn to illustrate each country revised. Learn the following notes on New Zealand :—

Area.—North Island 44,468 square miles.
South Island 58,525 square miles.
Stewart Island 665 square miles.

Population.—European, 703,360 } in April 1896.
Maori, 39,854 }

Climate.—Temperate—the mean temperatures for the different seasons being: spring, 55°; summer, 63°; autumn, 57°; winter, 48°. Admirably adapted for raising every fruit, flower, and food that can be produced in England.

Exports.—Beef (fresh), £146,000; butter, £338,000; cheese, £90,000; kauri gum, £321,884; mutton, £2,198,477; rabbits, £153,315; skins and hides, £309,456; tallow, £321,480; wool, £4,735,206.

From this it will be seen that New Zealand is very largely a pastoral country, although the land is in places very suitable for the growth of cereals, heavier crops of wheat being raised per acre than in any other part of the globe.

Imports.—Apparel, carriages, cotton goods, leather, iron and steel, machinery, spirits, woollens.

The annual revenue is about £5¼ millions. There is a national debt of about £47 millions, which has been incurred in the construction of public works, harbours, roads, railways, etc.

Government.
1. A governor aided by a ministry.
2. A Legislative Council of 48, appointed for seven years.
3. A House of Representatives of 74, elected for three years.

Four of the members are Maoris, elected by the natives.

Chief Towns.—Wellington, Auckland, Dunedin, Christchurch, Invercargill, Napier, Nelson, Oamaru.

All students should read Froude's *Oceana*—the chapters describing the visit to the islands.

The wonderland of the North Island, hot springs, volcanoes, the famous Pink and White Terraces (now destroyed), the character of the natives, etc., should receive attention.

2. *History.—Chief Points :—*

Henry VII.
(*a*) Causes of the high prerogative exercised by the Tudors.
(*b*) Yorkist risings.
(*c*) Home government. Suspension of parliamentary life; extended use of the Star Chamber. Accumulation of money by subsidies, by confiscation and fines after revolt, by benevolences, by exactions for breaches of obsolete laws.
(*d*) Foreign policy and marriage schemes. The marriage of Henry led eventually to the Reformation, and of Margaret to the accession of the Stuarts.

Henry VIII.
(*a*) Foreign wars—With France (Holy League against France): Field of Cloth of Gold.
(*b*) Home affairs. Power in Wolsey's hands; no parliament for eight years. Visitation of monasteries in 1524; suppression of forty small ones.
(*c*) The question of the divorce, and consequent fall of Wolsey.
(*d*) Royal supremacy over the church established; but Henry was *not* a reformer.
(*e*) Suppression of monasteries, 1536–39. Pilgrimage of grace. Note the use these institutions had been to the poor, and trace the results of suppression—riots, distress (tilled lands turned into sheep farms), various Acts against vagrants, and, finally, the Poor Laws of Elizabeth.
(*f*) Henry's wives.
(*g*) Lives of the chief men.

Edward VI.
(*a*) Introduction of the Protestant religion. Chief points in which the reformed religion differed from the old religion :—
(i.) English substituted for Latin in the services.
(ii.) Rejection of the worship of the Virgin and saints, and abolition of masses for the dead.
(iii.) Sacrament of both kinds administered.
(iv.) Disuse of auricular confession.
(v.) Rejection of the theory of transubstantiation.
(vi.) Clergy no longer condemned to celibacy.
(*b*) *Somerset's Protectorate.* Invasion of Scotland, and Battle of Pinkie. Vagrant Act. Act of Uniformity. Fall of the Protector.
(*c*) *Supremacy of Warwick.*

Mary.
(*a*) Lady Jane Grey's temporary sovereignty.
(*b*) Restoration of the Roman Catholic religion.
(*c*) Marriage with Philip of Spain. Wyatt's rebellion. Execution of Lady Jane Grey.
(*d*) The Marian persecution.
(*e*) The war with France, and loss of Calais.

Elizabeth.
(*a*) *Difficulties* at commencement of reign.
(i.) *At home.*—General social discontent. Impoverished treasury. No army, no navy; trade stagnant. Bitter feelings between Catholics and Protestants.
(ii.) *Abroad.*—Hostility of France, Spain, and the Pope.
(*b*) Re-establishment of the Protestant religion. Acts of Uniformity and Supremacy.
(*c*) Difficulties with Scotland and Mary Queen of Scots. Mary's deposition, imprisonment, escape, and flight to England.
(*d*) Plots against the Queen. Mary's execution.
(*e*) Note the general outlines of Elizabeth's foreign policy: at first to preserve the friendship, or at least to prevent rupture with France and Spain; afterward to prevent these powers invading England by (i.) helping the Netherlands against Spain, and (ii.) the Huguenots in France.
(*f*) General improvement in country. Increased trade; restored coinage; regulations for the relief of the poor; improved methods of agriculture; introduction of the weaving industry by French and Flemish refugees; disappearance of ill-will between Catholics and Protestants; development of a national patriotic spirit.
(*g*) The Spanish Armada, and results.
(*h*) The Irish rebellion.
(*i*) The growth of Puritanism.
(*j*) Advance of Parliament. (Freedom from arrest asserted. Claim to punish members and to determine contested elections. Bill for Abolition of Monopolies passed.)
(*k*) The Poor Laws.

During the Tudor period, the Renaissance—the revival of learning, the new birth of thought—took place, helped forward by invention of printing, religious controversies, foundation of schools and colleges, etc. The most remarkable result was the great outburst of English literature, especially under Elizabeth, and the production of dramas, which are more and more appreciated as time passes. The "dark ages" had passed away, and the "men of the new learning" were broader minded, better read, clearer thinkers, and reformers of scientific methods. The literature of the period requires especial study.

3. *Composition.—Notes or Specimen Essay on the Rise of the Drama:—*

The representation of historical scenes on the stage, or the acting of a play to teach the audience some particular lesson, is of great antiquity. The pleasure felt from watching mimic representations is universal amongst civilized nations, and appeals not only to adults, but also to children, whose games are very largely made up of "acting" some character. With the ancient Greeks theatre-going was a very favourite form of amusement, although in some cases the plays were of a semi-religious character.

But the English drama is not derived from the Latin and Greek writers; it has an origin of its own. Early in the twelfth century the clergy conceived the idea of teaching the ignorant populace some of the lessons and truths to be derived from passages of Holy Writ by acting the most striking scenes in the Old or New Testament. These Miracle Plays, as they were called, became very popular. They were acted at first in the churches and cathedrals, but as the audiences increased, it was found necessary to erect a platform in some public place. At the appointed time visitors flocked into the town from all the adjacent country, and followed with keen interest the story of the Creation, or Cain and Abel, or the life of Abraham, or the life and passion of Christ. To the present day the little village of Ober-Ammergau, in Bavaria, once in every ten years performs a passion play, in which nearly all of the inhabitants are actors. The chief incidents in the life of Christ are presented with the greatest solemnity and reverence.

At first the biblical story was strictly adhered to, but later on characters representing such abstract qualities as Vice, Death, Knowledge, Beauty were introduced, and the term "Morality" was given to the play, and frequently the religious aspect was lost in buffoonery and vulgarity.

Another class of plays was known as Interludes, which were generally shorter than the Moralities, and introduced real or historical personages. The scenery employed was usually of the roughest character, though where performances were regularly given, as at Chester, Wakefield, and Coventry, there was an attempt to reproduce scenes with greater fidelity.

While the monasteries were the sole repositories of learning and education, the Miracle Plays, Mysteries, Moralities, and Interludes were comparatively frequent; but with the revival of learning and the improved taste acquired by the study of Greek and Roman masterpieces, and more especially after the dissolution of the monasteries, they practically ceased in England.

Public interest in spectacular representations, however, did not decay, but with greater knowledge rather increased. To supply this want the Elizabethan drama sprang up with remarkable vigour and diversity. The first comedy, *Ralph Roister Doister*, was written by Nicholas Udall in 1540, and the earliest tragedy was *Gorboduc* or *Ferrex and Porrex*, by Thomas Sackville. The latter was acted before Queen Elizabeth by the gentlemen of the Inner Temple in 1562.

Although the profession of "play-actor" was far from being an honourable one, for they were classed in an old law with "rogues and vagabonds," the public demand for drama led to a great increase in production, and such dramatists as Greene, Ford, Massenger, Marlowe, Peele, Kyd, Dekker, and, prince of them all, Shakespeare, wrote comedies, tragedies, and historical plays which in many cases still remain as English classics.

The characteristics of these plays are high and fertile imagination and richness of vocabulary. The stirring events of the age influenced the writers enormously, and the "Elizabethan choir of song, sweet and strong," has never been surpassed.

4. *English.*—The first half of the eighteenth century is a remarkable period in English literature. It was the period of French influence on poetry, when the "stately tongue of England learned to dance the minuet of France." More attention was given to polish and finish of verses, and the Elizabethan writers were looked upon as semi-barbarians. The chief writers were Pope, whose versification is perfect, if his subject and thoughts are not always commendable. His translation of the *Iliad* is a fine poem, but it is not Homer; his *Dunciad* is one of the keenest satires in the language; his *Essay on Man* an incoherent and contradictory system of philosophy expressed in the finest language. Daniel Defoe wrote the immortal *Robinson Crusoe* and other tales, and may be considered the first novelist, although his works in that particular branch of literature were eclipsed shortly afterwards by those of Fielding and Richardson. Dean Swift wrote the satires, *Tale of a Tub* and *The Voyages of Gulliver*. Addison and Steele, in the columns of *The Spectator*, produced some of the finest essays and articles ever written.

The rise of the newspapers is also deserving of attention. Addison may be said to have created a reading public.

5. *Arithmetic.*—The explanations and examples given in Christian and Collar must be carefully studied, and as many of the exercises as possible worked. Exercise 96 should receive exhaustive study. All difficulties should be sent up for solution.

6. *Domestic Economy.*—The various methods of warming by open fires, stoves, hot air, and hot water must be noted, with their advantages and disadvantages. Ventilation is very important. Note the amount of air required per hour per individual, the number of times the air of a room of a certain size must be changed per hour, and the various devices—Sheringham valve, Boyle's mica ventilator, Tobin's tubes, the Louvre ventilator, etc.—for either admitting fresh air or allowing the escape of foul air.

Test Questions.

1. *Penmanship.* Large Hand:—*Refrangibility.*
Small Hand:—*A little knowledge is a dangerous thing.*

2. Point out the uses of mental arithmetic, and give a dozen questions suitable for Standard I.

3. Describe, with a sketch map, a voyage from Christiania to Hammerfest.

4. Say what you can of the industries, towns, and government of Victoria.

5. Write outline notes of a lesson on Active and Passive Voice.

6. By what means did Edward the Fourth obtain money? Give an estimate of his character.

7. Point out the chief results of the Wars of the Roses upon English life and institutions.

8. How would you prepare hydrogen, and how would you demonstrate its properties to a class?

9. Explain the structure of the minor scale, and give the three forms of its upper tetrachord.

10. Explain the chemical action of soap in washing, and point out the most economical way of using it. What may be used as a substitute?

CORRESPONDENCE: RULES.

To ensure an answer in the next issue, queries must be sent by the 15th of each month.

Name and address of sender, with coupon of current number of THE PRACTICAL TEACHER (and *nom de plume* if desired), must be enclosed.

As a rule, all replies will appear in the Correspondence Column; but any one desiring an immediate reply may obtain it by enclosing a stamped addressed envelope.

All communications and queries with regard to the PUPIL TEACHERS' AND SCHOLARSHIP COURSE should be addressed to "Mr. A. T. FLUX, The Bays, Belvedere, Kent."

ANSWERS TO CORRESPONDENTS.

Schoolmistress—(*a*) I do not think such a book is published. Send up your difficulties to me.
(*b*) Nelson's *Domestic Economy.*

Poppy.—Essay 40/60.—Cultivate a more vigorous style; the language is much too simple for the subject.

Semiramis.—Essay 45/60.—See remarks above.

K.H.—I should say not.

A.M.S.—It would be advisable if you can remember them. The lines are not, however, essential.

Glendwr.—Essay 42/60.

Orchid.—Essay 60/60. Very well and clearly expressed.

Muzhik.—From − 10° C. to 0 it regularly expands; at 0° it changes into water and contracts; it further contracts to 4° C., and then expands to 100° C.

Essays 53/60. Good, but still rather too *sure*. I fail to see that people act "foolishly" in going up the Rhine, to Switzerland, the Engadine, the Tyrol, or in taking a tour through Normandy and Brittany.

MODERN LANGUAGE COURSES FOR 1900.

THE committee of the Teachers' Guild of Great Britain and Ireland have just issued their new programme of Modern Language Holiday Courses for 1900. The courses, which have been arranged at Elbeuf, Lisieux, and Tours for the month of August, are "specially intended to promote among English people a knowledge of the language, customs, and ways of thought of the French nation. They are open equally to members of the Guild and to other persons, without restriction of age. All instruction will be given in French. Students must have already some knowledge of the written language at least. Those who have no knowledge at all of the spoken language, or very little, are advised to choose the classes of M. Muterel at Elbeuf, of M. Leconte at Lisieux, and of M. Marjault at Tours. The other lecturers will speak as slowly as necessary, but will assume that their listeners are capable of understanding spoken French." The fullest particulars as to classes, fees, journey, lodgings, etc., as well as a syllabus of lectures, may be obtained upon application to the secretary, H. B. Garrod, M.A., 74 Gower Street, London, W.C.

IN consequence of the new provision of the School Code which renders the teaching of the metric system compulsory in all standards above Standard III., and which recommends for the last-named standard elementary lessons on the notation of decimal fractions, Messrs. Cassell and Company are about to issue a sixpenny edition of *The Coming of the Kilogram*, by H. O. Arnold-Forster, M.P. This book, which was published in November 1898, is a simple yet comprehensive explanation of the Metric System. It has been adopted by the London School Board, and it is in use in many secondary and elementary schools.

OUR CERTIFICATE COURSE FOR 1900.

BY GEORGE COLLAR, B.A., B.SC.,

Head-Master of the Stockwell Pupil Teachers' School.

QUESTIONS ON LAST MONTH'S WORK.

THEORY OF TEACHING.

FIRST YEAR.—1. Discuss the advisability of teaching history by beginning at the present time and working backwards.

2. What are the benefits that a child should derive from a school course of history? What further advantages should an adult derive from a wider course of history?

SECOND YEAR.—1. What periodical tests should a head teacher make of each child's progress, and what records of the results should he keep?

2. What are the emotions that come most under the notice of a teacher, and how should he deal with them?

ARITHMETIC.

1. At what rate will £750 amount to £826, 17s. 6d. in two years?

2. Find the difference between the simple and compound interest on £915 for three years at 4½ per cent.

ENGLISH.

FIRST YEAR.—1. Give an outline of the argument of Epistle I. of the *Essay on Man*, and illustrate your answer by quotations.

2. Explain (and add Pope's illustrations to)—

"The bliss of Man (could Pride that blessing find)
Is not to act or think beyond mankind."

SECOND YEAR.—1. What dramatic purpose is served by the introduction of supernatural agencies in *The Tempest*?

2. Explain—"Infernal states;" "louring;" "manna;" "Tartarean;" and "Our final hope is flat despair."

GEOGRAPHY.

BOTH YEARS.—1. Give an account of the various races forming the population of Austro-Hungary.

2. Describe the basin of the Po, with special reference to the lakes, towns, and industries.

HISTORY.

BOTH YEARS.—1. Give an account of Warren Hastings.

2. What was the constitutional position of Ireland in the reign of George the Third?

NOTES AND SYLLABUS FOR MAY.

ENGLISH COMPOSITION.

Write essays on the following subjects:—

1. International Exhibitions.
2. Results of the Invention of Printing.
3. Competitive Examinations.

THEORY OF TEACHING.

FIRST YEAR.—Methods of teaching Drill, Drawing, and Music.

Drill has a twofold object—(*a*) the physical development of the individual child, (*b*) the production of disciplined movements from the whole class. It is essential that the teacher should know enough of physiology to understand the nature of the movements in the system of exercises adopted and their effect upon the development of the different muscles, also the respective effects upon the system of excessive exercise, moderate exercise, and none at all.

Drawing.—Requirements for each standard.

Music.—The advantages of teaching music in school. The relative merits of the two notations—note particularly the greater simplicity of the "sol-fa," and the universal employment of the "staff" notation. The best arrangement seems to be to use the "sol-fa" notation for the great bulk of school music work, but not to allow the children to leave without a course of lessons on the staff notation.

Logic.—Jevons, Lessons xxiv.–xxxiii. The student who has carefully studied the previous lessons will find no difficulty here, but much positive enjoyment and a vast amount of help in his twofold work of acquiring and imparting knowledge. The "method of discovery," which is described in Lesson xxiv., has lately been called the "heuristic method," and has been much discussed in connection with science teaching. The principles of analysis and synthesis require careful study. The conditions necessary for establishing a universal law should be remembered. They are:—

1. The examination of every case included: for example, No month has more than thirty-one days.

2. The examination of a large number of the cases: for example, All fishes will die if kept without water. Here the results obtained from a limited number of observations justify us in regarding the statement as true of all fishes.

3. The demonstration of the truth *from the general properties* in an individual case: for example, The angles at the base of an isosceles triangle are equal. Euclid's proof does not consist in taking a particular triangle and *measuring* the angles, but in showing that the equality of the angles is a necessary result of the equality of the sides, and it must therefore be true in the case of every triangle with equal sides.

SECOND YEAR.—*Psychology.* The will in its relation to education.

In studying "the elements of ethics with special reference to the government and discipline of children," the teacher should not bind himself down to any one system or school, but should rather make himself acquainted with the leading principles of each, and in practice play the part of an "opportunist." His duty is to train his pupils in good habits, and he will find that his pupils' dispositions are as varied as the ethical theories, and he will be able to apply one method to one child and another to another with much greater success than he would gain did he try to treat them by one uniform set of rules. The first question that arises when we wish to train children to do what is *right*, and avoid what is *wrong*, is—"What constitutes the difference between right and wrong?"

Apparently the simplest answer is that we recognise the difference *intuitively*. We cannot here discuss the arguments for and against "intuition" as the means of testing, but the teacher will generally find it sufficient to require his pupils to regard an act, in order to tell whether in itself it is right or wrong. The "hedonistic" school would say that right actions bring pleasure and wrong actions the reverse (*a*) to ourselves, or (*b*) to people at large. The danger of bringing this theory to bear on children is that they are not capable of distinguishing immediate from ultimate pleasure, and are apt to prefer selfish pleasure to pleasure afforded to others.

The considerations which guide our conduct, or rather the rewards or punishments attendant on conduct, are called by Bentham "sanctions," and are of four kinds:—

(*a*) *Physical*—the pleasures and pains resulting naturally from our acts, pleasant sensations, diseases, etc.

(*b*) *Moral or Social*—the regard of our actions by our fellowmen.

(*c*) *Political or Legal*—rewards and punishments administered by the State.

(*d*) *Religious*—the consideration of rewards and punishments bestowed by the Creator.

Habit and character require special study, and students cannot do better than read attentively the valuable chapter on Habit in James's *Text-book on Psychology*.

ENGLISH.

FIRST YEAR.—Revise the second epistle of the *Essay on Man*, with special reference to the derivation of words; see our notes in the last November and December numbers. Send up any difficulties not covered by them. Read again Macaulay's *Essay on Milton* and Johnson's *Life of Milton*. Compare the opinions of these two writers concerning Milton.

SECOND YEAR.—Read through the essays at leisure. Study *Paradise Lost*, Book II., lines 506–1055.

509. *Antagonist.* One who struggles against; *anti* = against. The root gives us *agony* (literally, a struggle), and the name of Milton's work, *Samson Agonistes*, which means "Samson the Wrestler."

512. *Globe* (Lat. *globus*) means not only a sphere, but a troop or crowd. *Seraphim*, a Hebrew plural form.

513. *Horrent*, terrifying; Lat. *horrēre*, to be rough, to bristle, to shake, and to cause fear. Milton seems to wish to include all these thoughts.

517. *Alchymy.* A Greek root with Arabic prefix, meaning originally the "fusion or combination;" hence it was applied to chemistry, the study which concerned combinations of bodies. Here it simply means an alloy—that is, brass. This figure—in which the name alchymy or brass stands for the *trumpet* made from it—is called *synecdoche*.

530. *Olympian games.* Games held by the Greeks every fourth year at Elis in honour of Jupiter, who was supposed to hold his court in Olympus. *Pithian games* were similar athletic contests held in honour of Apollo.

538. *Welkin.* The cloudy sky.

542. *Alcides*—that is, Hercules. The legend is that Hercules, after killing Eurytus at *Oechalia*, put on a poisoned robe brought to him from his wife by *Lichas*, his attendant. The robe caused him to die in great agony.

547. *Retreated.* Here a participle.

558. *Elevate.* Milton frequently uses adjectives of this form. *Elevate* is from the past participle *elevatus* of the verb *elevo*. Naturally enough adjectives should come from the participles, but, as in many words of literary origin, the same form is appropriated for the verb—for example, elevate, dedicate; we now use the English participial inflexion *-d* to form the adjectives. In words of popular origin, and also in many of literary origin, the English verb comes from the Latin present tense, and the nouns and adjectives from the Latin participle (or supine)—for example, *procedo*, *processum* gives verb "proceed;" but nouns "procession," "process."

568. *Obdurèd.* Hardened. Literally, made *hard*, to offer resistance *against* something.

592. *Serbonian bog*—that is, Serbonis, a marsh or lake near the mouths of the Nile.

594. *Parching.* Probably related to "piercing;" the word here will admit of that meaning, or of "drying," but obviously it is not related to "hot." Skeat says the etymology of parch is "very difficult."

595. *Frore.* From *froren*, past participle of *fréosan*, "to freeze." Some of the effects of heat, such as blisters on the skin, are also produced by intense cold.

596. *Haled.* A doublet with *hauled*.

600. *To starve.* From A.S. *steorfan*, "to die." The meaning is now limited to dying from want of food. In some parts of the country "starved with the cold" is an expression still in use.

611. *Medusa.* One of the three sisters called Gorgons. She had serpents for hair, and her aspect was so horrible that it turned all who beheld her to stone.

614. *Tantalus.* A mythical personage said to have divulged the secrets of Jupiter, and to have been punished by being placed in a lake, the water of which reached to his chin but receded whenever he attempted to drink. Over his head were ripe grapes which receded when he attempted to reach them. From his name comes the word "tantalise."

639. *Bengala* = Bengal. *Ternate* and *Tidore*, two of the Molucca Islands. Each name is of two syllables.

655. *Cerberean mouths.* Like those of Cerberus, the three-headed dog that guarded the gates of the lower regions.

660. *Scylla.* A female monster, said to dwell on a rock of the same name on the east side of the Strait of Messina; the one on the other side was Charybdis.

662. *Nor uglier follow the night hag.* The dogs that follow Hecate are not uglier than these were.

677. *Admired.* Wondered; not in modern sense.

678. (*God.....he*). This is a faulty sentence, since "God and His Son" are not "created things." Milton makes a similar error later on, when he says, "The fairest of her daughters Eve." Evidently Eve is the one woman who cannot be called a "daughter of Eve."

693. *Conjùred* = leagued. Participle, qualifying sons.

698. *Where I reign.....lord.* Where I reign not only king of the place, but king over *thee*, and I make this claim in order to enrage thee more.

709. *Ophiuchus.* A star-cluster resembling a man holding a serpent.

758. *Out of thy head.* The origin of *Sin* from the head of *Satan* was no doubt suggested by the fabled birth of Athena (that is, Minerva) from the head of Jupiter.

825. *Pretences* = claims.

828. *The unfounded deep.* The bottomless deep, or abyss.

842. *Buxom.* Yielding; the word originally meant obedient. Compare "*To be buxome to his biddynge*" (*Piers Plowman*, i. 110). It had no connection with "plump," as it has now.

869. *Voluptuous.* Full of pleasure.

900. *Embryon.* Modern form, *embryo* (noun) and *embryonic* (adjective) = rudimentary, undeveloped.

904. *Barca, Cyrene.* On the north coast of Africa.

906. *To whom these most adhere he rules.* The one who gains the support of most of these becomes ruler.

909. *Arbiter.* A judge or umpire.

910. *This wild abyss.* Compare Dryden's "Ode for St. Cecilia's Day."

> "From harmony, from heavenly harmony,
> This universal frame began.
> When Nature underneath a heap
> Of jarring atoms lay,
> And could not heave her head,
> The tuneful voice was heard from high:
> Arise, ye more than dead.
> Then cold and hot and moist and dry
> In order to their stations leap,
> And Musick's power obey."

922. *Bellona.* The goddess of war.

926. *Vans*—that is, *fans*, wings.

938. *That fury stayed.* Nominative absolute; when that fury came to an end.

939. *Syrtis.* The name of two gulfs on the north coast of Africa, noted for their quicksands.

945. *Arimaspian.* The Arimaspians inhabited North Scythia, and were fabled to have fought with griffins for the gold found in the Ural Mountains.

964. *Orcus and Ades* (or Hades). The gods of the infernal regions.

964. *The dreaded name of Demogorgon.* Demogorgon belongs to mediaeval mythology. This monster was so terrible that the mere mention of the name was sufficient to produce dreadful effects.

988. The word "said" is omitted in imitation of the Latin epic poets.

996. *Confusion worse confounded.* A very powerful phrase, often quoted.

1017. *Argo.* The vessel in which the *Argonauts* under Jason sailed in quest of the golden fleece.

1019. *Larboard.* The left-hand side of the ship, looking forward; *-board*, means *side of ship*, the derivation of *lar-* is uncertain. *Starboard*, means *steer-board;* formerly the vessel was steered by a large oar on the right side of it.

1023. *He once passed* (nominative absolute) = after he had once passed.

1024. *Alteration.* Objective case of exclamation. This must not be confused with nominative of address. (Compare "Unhappy *me!*")

History.

Both Years.—1782–89. We have already considered the history of this period in some of its aspects. The earlier part of the career of the younger Pitt should be carefully studied. Notice his rapid rise to influence, his refusal of a post in the second ministry of Rockingham, and his appointment as Chancellor of the Exchequer a few months later by Shelburne. Pitt became Prime Minister at the early age of twenty-five. In his budget of 1784, he endeavoured to diminish the amount of smuggling that was rife by lowering the customs duties; this was also his first step in the direction of "Free Trade," a system advocated by Adam Smith in his *Wealth of Nations* in 1776. In 1785, Pitt endeavoured to put these principles into practice by a commercial union between England and Ireland, but the manufacturing interests were too strong for him. In the next year Pitt was more successful in carrying out these principles, for he made a commercial treaty with France by which each country agreed to lower the customs duties on goods imported from the other.

Pitt made three unsuccessful attempts to secure Parliamentary Reform:—(*a*) in 1782 he endeavoured to get a Parliamentary committee appointed to inquire into the need of reform; (*b*) in 1783 he again tried the same means; (*c*) in 1785, being in power, he introduced a bill dealing with the subject and proposing an outlay of £1,000,000 for buying up seventy-two seats, which were really in the hands of private patrons.

The whole period should now be reviewed, and the following notes may be useful in dealing with the commercial and industrial history, which is really a very important part. At the beginning of the eighteenth century, England had come well to the front in the world's commerce; notice the trading companies centering round the South Sea Company. Trade quarrels were among the most important causes of the wars in which we were engaged during this period. Trade took us into India. During our period Josiah Wedgewood (1730–95) developed the manufacture of pottery in North Staffordshire.

Among the important inventions of the period are:—

1. *Spinning.*—Hargreaves' spinning-jenny (1770). Arkwright's spinning-frame, worked by water-power (1771). Crompton's "mule," combining the two above (1779).

2. *Weaving.*—Cartwright's power-loom (1785).

3. *Steam-engines.*—Newcomen's steam-pump, invented 1705. Boulton and Watt's steam-engine (1765); first used in mining operations, but in 1785 applied to spinning.

4. *Iron.*—Up to 1730 wood was used in smelting iron; in that year the blast-furnace was invented. This was improved in 1760 by Smeaton at Carron, where are now the largest iron-works in the British Isles. In 1740 we *imported* 20,000 tons of iron; in 1788 we *produced* 68,000 tons, and now about 4,000,000 tons annually.

5. *Agriculture.*—In this period "rotation of crops" was introduced, and the method of improving the breed of cattle by selecting the breeding stock was introduced.

Brindley, acting for the Earl of Bridgewater, showed how canals might be carried over natural obstacles.

Geography.

Both Years.—Continue the revision of the geography of the countries in Central Europe.

Peninsular Italy.—Study the position, coasts, important islands—large and small—lying off the coasts.

The chief feature in this part of Italy is the long ridge of mountains, the Apennines, extending throughout the whole length of the peninsula, and throwing off spurs to the coast. Near the source of the Tiber, the chain divides into two ranges, enclosing the wild and rugged plateau of the Abruzzi.

Note volcanoes on mainland and neighbouring islands.

The short slope of the Apennines is towards the nearly featureless east coast; while the long slope, nearly twice the width, watered by the beautiful Arno, the yellow, turbid Tiber, and other short streams, dips gradually to the west.

In studying the climate, which is much warmer than that of the north, note the abundant autumn rains, the protection from cold winds afforded by the Alps, the hot "sirocco" and the cold "tramontana" and "bora," the malaria bred by the pestilential marshes, such as the delta of the Po, the Campagna, the Pontine marshes. Study the productions, noting especially the vine (Italy now coming before France in wine-making) and farm produce; the fisheries are highly important.

The people are engaged in agriculture, manufacture, fishing, and trade.

The most important manufactures are established in the north, but Florence (porcelain), Naples (coral ornaments), villages of Tuscany (straw hats), Sardinia (silk and velvet), all carry on manufactures.

Study commerce, means of communication, and the most important towns.

Consider the effect on the trade, etc., of Italy of the discovery of the Cape route to the East, of the opening of the Suez Canal, of the construction of railway-tunnels through the Alps; note effect especially on Genoa, Naples, Palermo, Brindisi. Note aristocratic republic of San Marino.

The Balkan Peninsula.—Study first the geography of the peninsula as a whole, without reference to the political divisions. Learn the position (Austria, part of Danube, Carpathians forming north boundary of the peninsula); extent; observe the much-indented coasts, the long, narrow peninsulas, the straits, and the many islands. Mark all the important ones in a sketch map. The northern part of the peninsula forms part of the great plain of the Danube; the west and south are filled with irregular mountain ranges confusedly massed, and generally well wooded.

The *Balkans* stretch east and west across the peninsula, south of the plain of the Danube; from the main chain there are four minor ranges—one extending north as far as the Iron Gate; a second, the Rhodope or Despoto Dagh, running south-east, walling in the basin of the Maritza; another, the Little Balkans, extends from the eastern portion of the main chain south-east to Constantinople; while a fourth trends west to Albania, where it culminates in Skhar Dagh, the highest point in the peninsula.

Other mountains which should be noted are the Dinaric Alps, along the east coast of the Adriatic; and the Pindus Range, extending from the Skhar Dagh southward into Greece; note Olympus, Parnassus, etc.

Study rivers, climate, and products of the peninsula.

Political Divisions.—The Balkan Peninsula has had a very eventful history, and frequent changes in boundaries. In studying, note the following:—

1. The separate states of Greece, in the south of the peninsula, formed part of the Roman Empire centuries before Constantine.

2. Constantine, the first Christian emperor, founded Constantinople (Byzantium), which became the capital of the Eastern Empire.

3. Various states were taken by northern invaders; the Bulgarians founded an empire; the Slavs formed Servia.

4. The Turks passed from Asia Minor across the narrow Bosphorus, and captured Constantinople (1453).

5. Struggles of the oppressed Christians under Turkish rule continued into the seventeenth century, since which time, after the defeat in 1683, when they were repulsed by Sobieski, Turkish power has diminished.

6. The independence of Greece was acknowledged in 1830.

7. The Treaty of Berlin (1878) closed the Russo-Turkish War of 1877–8. Note the division of the Balkan Peninsula according to the Treaty of Berlin.

1. *Turkey proper*, having Bulgaria, Servia, and Montenegro on the north; Greece, Ægean Sea, and Sea of Marmora on the south; and extending between the Black and Adriatic Seas.

2. *Bulgaria and Eastern Roumelia.*—Bulgaria is governed by a prince elected by the National Assembly, and is therefore virtually independent; but it acknowledges the suzerainty of the Porte by payment of an annual tribute. Since 1886, Eastern Roumelia has formed an integral part of the Principality of Bulgaria; it is governed by a Christian governor-general appointed by the Porte and approved by the Great Powers. Bulgaria and Eastern Roumelia are nominally parts of the Ottoman Empire.

3. *Bosnia and Herzgovina*, occupied and administered by Austria-Hungary.

4. *Kingdoms of Roumania and Servia, Principality of Montenegro*, all independent.

5. *Greece.*

Study the exact positions, chief productions and industries, and important towns of each.

Russia occupies the whole of Eastern Europe.

In studying the physical features, refer to the geography of the Sarmatian Plain, which almost coincides with Russia; note the four great natural divisions from north to south:—

1. The Tundras, barren owing to rigorous climate; ice-bound during the long winter; covered in summer with moss and lichens, on which the reindeer of the Lapps and Samoyedes feed.

2. The Forest Zone (64° N.–56° N.)—woods and marshes alternating with cultivated land; products of forest—timber, potash, resin, pitch, wood-tar; products of cultivated lands—oats, barley, rye, flax, hemp. In the east of this zone mining for gold, platinum, iron, and copper is carried on. St. Petersburg lies in this district.

3. *The Industrial Zone.*—In this region, which contains Moscow, Warsaw, Lodz, Nijni-Novgorod, and other large towns, agriculture, mining, and manufacture employ the people. [Read a description of the "mir" or peasant village-communities, and consider effect on agricultural pursuits of the parcelling out of the land; note "Black Earth Zone."]

Manufactures are not much developed, though the textile industries are growing; mining is important, and the metal-works of the Ural region exhibit great manufacturing skill.

Refer to notes on "Build of Europe;" note that Norway is the steep west side of the highland; Sweden, the long gradual slope. Study the general geography of the peninsula, and then the products, industries, chief towns of each country.

Study the governments of Europe as follows:—

1. *Monarchies.* (1) *Absolute or Despotic.* (*a*) *Russia.* Czar, four councils—namely, the Council of the Empire, the Directing Senate or High Court of Justice, the Holy Synod, the Council of Ministers. (*b*) *Turkey.* Sultan, Sublime Porte; the two chief ministers—the Grand Vizier or Prime Minister, and the Sheik-el-Islam or High Priest. (*c*) *Monaco.*

(2) *Limited.* Those countries not otherwise mentioned in this plan. Note that in the German Empire each state retains its own independent internal administration, and the Federal Council is formed of members sent up by the various states; that in Austria-Hungary the two kingdoms are united by having one hereditary sovereign and a common army and navy, but each has its own parliament.

2. *Republics.*—France, Switzerland, San Marino in Italy, Andorra in the Pyrenees.

Algebra.

Women—Both Years.—Further practice in factors and equations.

Men—First Year.—Arithmetical and geometrical progressions. Prepare proofs and work examples.

Men—Second Year.—Scales of notation.

Euclid.

All Years.—Revise the text and work plenty of deductions. Send up difficulties.

Latin.

See The Practical Teacher Matriculation Course.

French.

First Year.—Revise grammar of verbs and pronouns. *Le Voyage au Centre de la Terre*, chap. xxv. to end.

Second Year.—*Le Roi des Montagnes*, p. 156 to the end, with Exercises xix., xx., at the end of The Practical Teacher edition.

Answers to Correspondents.

R.P.—The reason that "must" does not take an "s" in the third person singular is that it is really a past tense form. This is further shown by comparison with Anglo-Saxon and German.

LONDON MATRICULATION.

JUNE 1900.

BY R. C. B. KERIN, B.A. (LOND.),

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LATIN COURSE FOR MAY.

1. Cæsar.—Revise the prescribed chapters in Books IV. and V.

2. Grammar.—Learn the rules for *oratio obliqua*. Learn the uses of the various temporal conjunctions. Learn the Roman calendar thoroughly. Note the Roman system of (*a*) money, (*b*) names. Suffixes and prefixes are important.

Revise the accidence of nouns, pronouns, adjectives, and adverbs. In the Syntax, revise the cases, adjectives, and pronouns.

3. *Anglice Reddenda*, Nos. 80–90.

4. Sentences from Bradley's *Arnold* or Bayfield's or Allen's *Exercise Book*.

Latin Grammar Notes.

The definition of *oratio obliqua* is very important.

Three changes occur in passing from *oratio recta* to *oratio obliqua*—(1) mood, (2) person, (3) tense. The verb in the principal clause, as a rule, becomes the infinitive; the imperative, however, becomes the subjunctive, and questions are put in the subjunctive if they are real questions, and in the second person. The verbs in the subordinate sentences are put into the subjunctive. The tenses of the subjunctive will follow the rules of the sequence of tenses. The first and second persons in *oratio recta* become the third person in *oratio obliqua*.

The following passages of *oratio recta* and *oratio obliqua* are taken from the *Elementary Latin Grammar* by Professor J. Roby and A. S. Wilkins (Macmillan). Students will do well to go over these passages carefully.

Oratio recta.—Si pacem populus Romanus cum Helvetiis faciet in eam partem ibunt atque ibi erunt Helvetii ubi tu eos constitueris; sin bello persequi perseverabis reminiscetor et veteris incommodi populi Romani. Quod improviso unum pagum adortus es ne ob eam rem aut tuae magnopere virtuti tribueris aut nos despexeris. Quod si veteris contumeliae oblivisci volo num etiam recentium iniuriarum quod me invito iter per provinciam per vim temptastis quod Aeduos, quod Ambarros, quod Allobrogas vexastis memoriam deponere possum?

Oratio obliqua.—Si pacem populus Romanus cum Helvetiis faceret in eam partem ituros atque ibi futuros Helvetios ubi eos constituisset: sin bello persequi perseveraret, reminisceretur et veteris incommodi populi Romani. Quod improviso unum pagum adortus esset, ne ob eam rem aut suae magnopere virtuti tribueret aut ipsos despiceret. Quod se veteris contumeliae oblivisci vellet num etiam recentium iniuriarum quod se invito iter per provinciam per vim temptassent quod Aeduos, quod Ambarros, quod Allobrogas vexassent, memoriam deponere posse?

Note, in the above—(*a*) *faciet*, future indicative, becomes subjunctive imperfect on account of the sequence of tenses; (*b*) *ibunt* becomes *ituros*, because the verb of the principal clause is turned into the infinitive, while its subject, *Helvetii*, becomes the accusative, *Helvetios*; (*c*) *constitueris*, future perfect indicative, becomes pluperfect subjunctive, and the second person is changed into the third person; (*d*) *reminiscetor*, the future imperative, becomes the imperfect subjunctive, third singular; (*e*) *ne tribueris*, the perfect subjunctive with *ne*, expressing a prohibition, becomes the imperfect subjunctive with *ne*, and is changed into the third person; (*f*) *tuae* becomes *suae*, not *eius*, as it refers to the subject of the verb *tribueret*; (*g*) *nos* becomes *ipsos*—if *se* were used instead of *ipsos*, it would more naturally refer to the subjunctive of *despiceret*; (*h*) *possum* becomes the *infinitive*, as it is a *rhetorical* question; (*i*) *me* becomes *se*.

The numerals must be known. Dates, too, are important. Note the following typical cases:—

Oct. 1...Kalendis Octobribus.....Kal. Oct.
Oct. 4...Ante diem quartum Nonas Octobres A.D. IV. Non. Oct.
Oct. 11...Ante diem quintum Idus Octobres A.D. V. Id. Oct.
Oct. 14...Pridie Idus Octobres..... Prid. Id. Oct.
Oct. 15...Idibus Octobribus.....Id. Oct.
Oct. 24...Ante diem nonum Kalendas.....A.D. IX. Kal. Nov.
Oct. 31...Pridie Kalendas Novembris.....Prid. Kal. Nov.

Remember the rhyme for the date of the Nones and Ides:—

"In March, July, October, May,
The Nones are on the seventh day."

The Ides are, then, on the fifteenth. For the other months the Ides are on the fifth, and the Nones are on the thirteenth.

Note that *before* 45 B.C., March, July, October, and May had thirty-one days, February twenty-eight or twenty-nine, and the rest had only twenty-nine, not thirty. Remember this if the date given to you is then in a year preceding 45. The calendar was reformed by Julius Cæsar in 45 B.C., as it was found that the years in accordance with the old system were too short.

The year is expressed by the *ordinal*, and not by the *cardinal*—for example, 143 A.U.C. (*ab urbe condita*) is: *Anno centesimo quadragesimo tertio ab urbe condita* (or *urbis conditae*).

Note how to express 40 B.C.:—*Anno septingentesimo decimo quarto ab urbe condita*. Rome was founded in 753. Now, 753 (− 40 + 1) = 714. Therefore, 40 B.C. is the seven hundred and fourteenth year from the foundation of the city. Note that you have to add one after subtracting, owing to the practice of inclusive reckoning.

Note that "on September 6" is *ante diem octavum Idus Septembres*, "before September 6" is *ante ante diem octavum Idus Septembres*. All such phrases are regarded as nouns, and any preposition can be used before them. Of course, in expressions like "before May 1st," *ante Kalendas Maias*, *Kalendas* is put into the accusative after *ante*.

It is also important to know the fractions of the *as*, as they are used in denoting the portion of an inheritance received, and also in calculating interest—for example, *Heres ex semisse patri factus est*, "He was left heir to one half his father's property;" "He lent him 300 sesterces at 6 per cent.," *Ei trecentos sestertios mutuos semisse dedit*. The *as* was regarded as 1 per cent. per month—that is, 12 per cent. per annum; therefore *semis*, half of an "as," is half 12 per cent.—that is, 6 per cent. The interest is put in the ablative.

With regard to sesterces, note the following types:—

1,000 sesterces = *mille sestertii*.
4,000 ,, = *quatuor milia sestertium* (genitive plural), or *quaterna sestertia*.
3,000,000 ,, = *tricies* (*centum milia*) *sestertium*. (*Sestertium* is here irregularly regarded as a single neuter noun, and declined accordingly, though it is really the genitive plural.)
4,320,506 ,, = *quadragies trecenta* (*ter*) *viginti milia, quingenti sex sestertii*.

Note that 1,000 H.S. = £8, 10s. If you are given English money, you must turn it into Roman money, and then translate.

Typical Sentences.

33. "If I were to say that you were the second who went away you would be angry with me."

Si te secundum abiisse dicam mihi irascaris.

Notes.—(*a*) Subjunctive with *si*, because subjunctive is used in principal clause. (*b*) Note how the English second is translated as a complement of the verb "to be." (*c*) *Irascor* governs the dative.

34. "He treated me as if he were my brother."

Me usus est quasi frater meus esset.

Notes.—(*a*) *Quasi*, *velut si*, etc., are followed by the subjunctive. The apodosis to *esset* is suppressed. If expressed, it would be in the subjunctive, therefore *esset* is in the subjunctive. (*b*) *Utor* governs the ablative.

35. "Most people thought that if news of Pompey's defeat had not come then, Domitius would have taken the city by storm."

Nisi tum nuntii de Pompeii clade essent allati, plerique Domitium urbem expugnaturum fuisse existimabant.

Notes.—(*a*) The apodosis in this sentence is not "most people thought," but "would have taken." We have seen before that "would have" in a principal clause is expressed by the pluperfect subjunctive. It is not permissible here, however, to use the pluperfect subjunctive, as the "would have" sentence is introduced by "that," and depends on a verb of "thinking," which requires the infinitive. Now "would have," when the infinitive is required, is expressed in two ways: (i.) if the verb is active and has a supine, by the future participle, with *fuisse*; (2) by *futurum fuisse ut* and imperfect subjunctive, if the verb (i.) has no supine, or (ii.) is passive. Hence above we have *expugnaturum* (agrees with *Domitium*) *fuisse*. (*b*) *Essent allati* is in subjunctive, because the apodosis "if" in *oratio recta* would be in subjunctive. (*c*) "Of," when equivalent to "concerning," is often translated by *de*. With verbs it is generally translated in this way—for example, "I speak of you," *De te loquor*. (*d*) Distinguish *plerique*, "most people," from *plurimi*, "very many."

36. "No one told me what the enemy could have said if they had known that the army had been on the brink of destruction."

Nemo quid hostes dicturi fuerint mihi dixit si haud multum abfuisse quin exercitus periret scivissent.

Notes.—(*a*) The apodosis to the "if" clause is again in a

dependent clause—namely, in an indirect question clause depending on *dixit*. The apodosis containing "would have" would in *oratio recta* be pluperfect subjunctive; therefore, according to the rule, the verb in the "if" clause is in the subjunctive; hence we write *scirissent*. (*b*) In dependent questions and in consecutive clauses (that is, in clauses expressing result, introduced in English by "so that") "would have," if the verb is active, is expressed by the so-called periphrastic subjunctive (that is, by the future participle and the perfect subjunctive of *sum*). Hence above we write *dicturi fuerint*. (*c*) Note how to express "on the brink of"—literally, "it was not much absent but that."

37. "We said that if we had ordered you to go to Rome the town would not have been lost."

Si tibi ut Romam ires imperavissemus futurum fuisse ut oppidum amitteretur negarimus.

Notes.—(*a*) The subjunctive *imperavissemus* is used as before, because the apodosis is "would have been lost." (*b*) "Would have been lost" has to be translated by the infinitive, because verbs of "saying" require the infinitive when in English there is a "that" clause or its equivalent. Now, "would have been," when the infinitive is required, is translated by *futurum fuisse ut* and the imperfect subjunctive passive, in accordance with the rules given above. (*c*) Note that in English, where we say, "say.....that not," the Latins place the negative with the verb of saying, and use *nego*—literally, "deny that." (*d*) Be careful not to use the infinitive after *impero*, "order." The only verb of ordering that normally requires the infinitive is *iubeo*. Be careful, too, not to use the accusative with *impero*. The person to whom an order is given is put in the dative; the thing that is requisitioned is put into the accusative.

38. "I should have no hesitation in telling you to-morrow my political opinions, if I hoped to be of assistance to you."

Quid de respublica sentiam tibi cras dicere non dubitem si me tibi auxilio fore sperem.

Notes.—(*a*) The present subjunctive is used in both clauses, because (1) there is a "should" in the apodosis; (2) the condition refers to future time. (*b*) *Non dubito*, "I do not doubt," followed by a "that" clause, requires *quin* and the subjunctive in Latin. When, however, *non dubito* means "I do not hesitate to," use the infinitive in Latin, as in the sentence above. (*c*) *Respublica* in Latin is often equal to "politics," "political life;" avoid *politicus*. The phrase above literally means "what I think about politics," and the subjunctive is due to the dependent question. (*d*) *Auxilio* is predicative dative. Note the future infinitive after verbs of "hoping."

39. "Do not advise him to resist the soldiers, all of whom are now less than three miles away."

Ne eum monueris (noli eum monere) ut militibus resistat qui omnes nunc minus (quam) tria milia passuum absunt.

Notes.—(*a*) Prohibitions in the second person are expressed either by *noli* and the infinitive or by *ne* and the perfect subjunctive. The American grammarian Elmer has shown lately that *ne*, with the perfect subjunctive, is not the usual form, except colloquially, but that *noli*, with the infinitive, is the common Ciceronian form. Do not use *ne* with imperative. This is a poetical construction. *Non*, with the *imperative*, is only found in bad Latin. (*b*) If *monueris* is used, it is to be treated as a primary tense, hence the present subjunctive *resistat*. (*c*) *Ut* and subjunctive are used because a purpose is implied. (*d*) *Resisto* takes the dative. (*e*) After *minus*, *amplius*, and *plus* the *quam* can be omitted before numerals, and the ablative need not be used. (*f*) *Milia*, accusative of space. (*g*) Be careful not to say *quorum omnes*.

Sentences for Practice.

(Readers can have their solutions corrected by sending them to the Editor Matriculation Course, *P. T.*, and enclosing seven stamps.)

1. If we had told your brother to save the city, he would undoubtedly have made it his aim to obey your orders.
2. I could not have blamed him for marrying this girl if his father had urged him to do so.
3. It seems that he stopped in the city of Syracuse from March 2 to September 27, 54 B.C.
4. It is said that he was left heir to half his brother's property.
5. He expected to sell the house for twice the sum of money he paid for it.
6. If you were to promise him to-morrow to sell the house for 4,000,000 sesterces he would not be angry with you.
7. I know for certain how much this victory cost (*consto*) the citizens of Rome.
8. On April 1 we left the city of Carthage with our friends, and arrived at Naples before July 3.
9. Do not ask your friend who stopped with me four days ago.
10. If I lend him 4,253,654 sesterces he will never repay me.

QUERY COLUMN.

RULES.

1. Each correspondent is restricted to *one* question.
2. Each query must be accompanied by the name and address of the correspondent, and the *coupon* which appears on the back wrapper of the current number of the Journal.
3. CORRESPONDENTS MUST IN ALL CASES STATE THE SOURCE FROM WHICH THEIR QUERY HAS BEEN OBTAINED.

The Editor reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

Alpha.—AB is a diameter of given circle: find a point P on the circumference such that the chord AP is twice the chord BP. (S. and A., 1899.)

Draw a figure showing A, P, B, and O, the centre of AB.

Analysis.—Suppose AP = 2 PB. Draw ON bisecting AP at right angles. Then NP = PB; hence PNB = half a right angle, since NPB is a right angle; therefore ONB is half a right angle. The *point* N *is now fixed*, for it must be on a segment of a circle standing on OB, and containing half a right angle; also, since ANO is a right angle, N is on a semicircle, with AO as diameter.

Solution.—On AO describe a semicircle. On OB describe a segment of a circle containing an angle of half a right angle (III. 33). Let these arcs intersect at N. Join AN, and produce to meet, in P, the given semicircle; then will AP = 2 PB.

Proof.—Since N is on a semicircle, ON is perpendicular to AP (III. 31); therefore NP = ½ AP. Since ONB is half a right angle, so also is BNP; hence NBP is half a right angle, since the angle at P is right (III. 31). Therefore PB = PN = ½ AP. (*Q. E. D.*)

Crescent.—The electrical resistance of a wire of given material varies directly as the length and inversely as the square of the diameter. Find the length and diameter of a wire which is to have ¾ of the electrical resistance and ¼ of the weight of a wire of the same material, 50 feet in length and ·03 inch in diameter. (Stage 2, 1898.)

We have given that $R \propto \frac{l}{d^2}$, or, better, $R = a\frac{l}{d^2}$, where a is a constant which can be found if necessary.

For first wire, $R_1 = a\frac{600}{(\cdot 03)^2}$.

For second wire, $R_2 = a\frac{L}{D^2}$.

$$\therefore \tfrac{3}{4} R_1 = a\frac{L}{D^2};$$

that is, $\frac{3}{4} a\frac{600}{(\cdot 03)^2} = a\frac{L}{D^2}$.

$$\therefore \frac{L}{D^2} = \tfrac{3}{4}\frac{600}{(\cdot 03)^2} \quad . \quad . \quad . \quad . \quad . \quad (1)$$

But if w = density of material, we have—

$$wLD^2 = \tfrac{1}{4} w 600 (\cdot 03)^2 \quad . \quad . \quad . \quad (2)$$

Multiply (1) by (2), then

$$L^2 = 90000;$$

$$\therefore L = 300 \text{ inches, or } 25 \text{ feet.}$$

Then from (2), $300 D^2 = \frac{1}{4} 600 (\cdot 03)^2$,

$$D^2 = \tfrac{1}{8} (\cdot 03)^2;$$

$$\therefore D = (\cdot 03)\sqrt{\tfrac{1}{8}}$$

$$= (\cdot 03)\tfrac{1}{4}\sqrt{6}$$

$$= \cdot 0245 \text{ inch.}$$

Felix.—A perpendicular is drawn from the vertical angle A, of a triangle ABC; and if two straight lines be drawn intersecting each other in the perpendicular, and terminating in the opposite sides, the straight lines drawn from these points to the intersection of the perpendicular with the base shall make equal angles with the base. (Pott's *Euclid*, Book I., No. 66.)

Obviously the question is an impossible one in the form given. Have you omitted something?

Math.—ABCD is a square. Show how to draw a line from D cutting BA and CB (produced if necessary) in F and E, so that FE is a given length. (S. and A.)

(*N. B.*—In future please state what stage the question is taken from; you will see that this information is desirable when the question is one of geometry.)

So far we have not been able to discover an elementary solution. Perhaps some reader of THE PRACTICAL TEACHER may know of one, in which case the editor will be glad to receive it for publication.

Timothy.—A bullet moving at the rate of 1100 feet per second passes through a thin plank, and comes out with a velocity of 1000 feet per second. If it then passes through another plank exactly like the former, with what velocity will it come out of the second plank?

The data of the question are not sufficient to enable other than an approximate answer to be given, and this may be obtained either by considering the *kinetic energy* or *momentum* of the bullet. The former gives a more accurate result than the latter.

Let m denote the mass of the bullet; its kinetic energy is given by $\frac{1}{2}mv^2$, where v is the velocity of the bullet in feet per second.

As the velocity of the bullet when it leaves the first plank is 1000 feet per second, and the velocity on entering 1100 feet, the loss of kinetic energy during the penetration is $\frac{1}{2}m \times 1100^2 - \frac{1}{2}m \times 1000^2$, or $\frac{1}{2}m(1100^2 - 1000^2) = \frac{1}{2}m \times 210{,}000$.

The velocity of the bullet just before penetrating the second plank is 1000 feet per second. Assuming that the amount of energy lost in the penetration of the second is the same as the loss in the penetration of the first plank, then the kinetic energy of the bullet when it emerges is $\frac{1}{2}m \times 1000^2 - \frac{1}{2}m \times 210{,}000$.

Hence, denoting the velocity with which the bullet will come out of the second plank by v, we have the relation—

$$\frac{1}{2}m \times 1000^2 - \frac{1}{2}m \times 210{,}000 = \frac{1}{2}mv^2.$$

$$\therefore v^2 = 1{,}000{,}000 - 210{,}000 = 790{,}000,$$

$$\text{or } v = 100\sqrt{79} = 888{\cdot}8 \text{ feet per second.}$$

If the equation of momentum be used, the result obtained for v is a little greater. Thus, loss of momentum in penetrating the first plank $= m \times 1100 - m \times 1000 = 100m$.

As before, assuming the loss in each plank to be the same, then we have—

$$m \times 1000 - 100m = mv.$$

$$\therefore v = 900 \text{ feet per second.}$$

Bike.—A, B, C are given points on the circumference of a carriage wheel. The arc AB $= \frac{1}{3}$ (circumference), and the arc BC $= \frac{1}{12}$ circumference. In what position of the wheel will the sum of the heights of the points be a maximum or a minimum?

(Stage 5, 1898.)

Draw a figure in which O is the centre of the wheel. Let OA make an angle θ with the ground. AOB is 120°, and AOC is 150°; hence OB makes $120° + \theta$, and OC $150° + \theta$, with the ground. If S is the sum of the heights, and a the radius of wheel, then

$$\begin{aligned}
S &= (a + a\sin\theta) + (a + a\sin(120° + \theta)) + (a + a\sin(150° + \theta)) \\
&= 3a + a\{\sin\theta + \sin(120° + \theta) + \sin(150° + \theta)\} \\
&= 3a + a\{\sin\theta + 2\sin(135° + \theta)\cdot\cos 15°\} \\
&= 3a + a\left\{\sin\theta + 2\cdot\frac{\sqrt{3}+1}{2\sqrt{2}}\cdot\sin(45° - \theta)\right\} \\
&= 3a + a\left\{\sin\theta + \frac{\sqrt{3}+1}{\sqrt{2}}\cdot\frac{\cos\theta - \sin\theta}{\sqrt{2}}\right\} \\
&= 3a + \frac{a}{2}\left\{(\sqrt{3}+1)\cos\theta - (\sqrt{3}-1)\sin\theta\right\} \\
&= 3a + \frac{a}{2}\left\{\frac{\sqrt{3}+1}{2\sqrt{2}}\cos\theta - \frac{\sqrt{3}-1}{2\sqrt{2}}\sin\theta\right\}2\sqrt{2} \\
&= 3a + \frac{a}{2}\Big(\cos 15°\cdot\cos\theta - \sin 15°\cdot\sin\theta\Big)2\sqrt{2} \\
&= 3a + a\sqrt{2}\cos(15° + \theta),
\end{aligned}$$

which is a maximum when $\cos(15° + \theta)$ is a maximum—that is, when $15° + \theta$ is zero, or $\theta = -15$. It is a minimum when $\cos(15 + \theta)$ is -1—that is, when $\theta = 165°$. The maximum and minimum values are $3a + a\sqrt{2}$ and $3a - a\sqrt{2}$.

Cymro.—Show that the radius of curvature of the cissoid $y^2(2a - x) = x^3$, at the point whose abscissa is a, is $\frac{5\sqrt{5}a}{3}$.

(B.A. Exam., R.U.I., 1897.)

$$\text{Radius of curvature} = \frac{\left\{1 + \left(\frac{dy}{dx}\right)^2\right\}^{\frac{3}{2}}}{\frac{d^2y}{dx^2}},$$

$$y = \frac{x^{\frac{3}{2}}}{(2a - x)^{\frac{1}{2}}}.$$

$$\therefore \frac{dy}{dx} = \frac{(2a - x)^{\frac{1}{2}}\cdot\frac{3}{2}x^{\frac{1}{2}} + x^{\frac{3}{2}}\cdot\frac{1}{2(2a - x)^{\frac{1}{2}}}}{(2a - x)} = \frac{x^{\frac{1}{2}}(3a - x)}{(2a - x)^{\frac{3}{2}}},$$

$$\frac{d^2y}{dx^2} = \frac{(2a - x)^{\frac{3}{2}}\left\{x^{\frac{1}{2}}(-1) + \frac{1}{2}(3a - x)\frac{1}{x^{\frac{1}{2}}}\right\} + x^{\frac{1}{2}}\cdot(3a - x)\frac{3}{2}(2a - x)^{\frac{1}{2}}}{(2a - x)^3}$$

$$= \frac{3a^2}{x^{\frac{1}{2}}(2a - x)^{\frac{5}{2}}}, \text{ after simplification.}$$

When $x = a$, $\frac{dy}{dx} = 2$, and $\frac{d^2y}{dx^2} = \frac{3}{a}$.

$$\therefore \text{radius of curvature} = \frac{(1 + 4)^{\frac{3}{2}}}{\frac{3}{a}} = \frac{5^{\frac{3}{2}}a}{3}$$

$$= \frac{5\sqrt{5}a}{3}.$$

J. T.—(*a*) The best book on Advanced Light is that by Professor Thomas Preston (Macmillan and Co.). It is rather expensive (17s. 6d.), but that, you say, is no disadvantage to you. It is well illustrated, and though not intended to serve as a laboratory text-book, yet it contains good descriptions of all the most classical experiments. It is so written that the mathematical parts may be omitted without serious loss by readers not qualified to follow this part of the argument. The syllabus of instruction in Physics at the Royal College of Science (Eyre and Spottiswoode, 1s.) contains instructions for the performance of many simple yet important experiments on light. The part of Deschanel's *Physics* devoted to light might also be useful to you.

(*b*) Catchpool's *Sound* (U.C.C.) is a very good elementary work. You might obtain assistance from Deschanel, or Watson's newly-published volume on Physics (Longmans, 10s.). A perfectly satisfactory book for the purpose you require cannot, however, be recommended.

IRISH ELEMENTARY EDUCATION.

THE promised changes in Irish elementary education will, no doubt, be important and far-reaching in their results. The excitement caused by recent circulars must surely be very great, to judge from the opening sentences in a leading article in one of our educational contemporaries—so great, indeed, as to transcend the limits of expression provided by ordinary English, even when aided by a little of what is evidently supposed to be French:—"The circulars recently issued by the Board of National Education clearly portend the death and burial of the results system. The tesselated mosaic of shillings and sixpences has at last got the *coup de gras*" (*sic*). Regarded as a sample of mixed metaphor and the like, this is emphatically "no bad."

THE NATIONAL HOME-READING UNION.

THE National Home-Reading Union has still on sale (price 2d.) the Inaugural Address by Sir George Kekewich delivered at the Summer Assembly of the Union in 1898. It is excellent reading, and worth much more than it costs to any teacher, whether he conducts a reading circle in his school or no. We strongly recommend, wherever possible, the formation of a first class into a circle connected with the Union. Guidance is then forthcoming in the monthly magazine supplied to the leader for his nominal fee (1s. 6d.), which treats in scholarly fashion of the books in course of reading. In Evening Continuation Schools such a reading class can be divided so as to include elocution.

The Nottingham Board, we hear, is very active in appropriating the benefits provided by the Union for its schools, and we know by experience that the School Board for London is equally desirous to help its scholars in the same way, if the teachers show themselves willing.

All the information that can be desired by any one wishing to work on the well-arranged and cleverly-devised lines of the National Home-Reading Union can be obtained most readily from the Secretary, National Home-Reading Union, Surrey House, Victoria Embankment, W.C.

OUR SCIENCE SECTION

☛ **Subscribers requiring Explanations of Difficulties in any branch of Science, or Advice upon Courses of Study, can obtain all help required by communicating with the Editor, and accompanying their query with the Coupon cut from this Number.**

STAR STUDY
FOR SCHOLARSHIP STUDENTS.

VI.—MAY.

OUR first duty is to indicate the positions of the constellations that have already come under our notice.

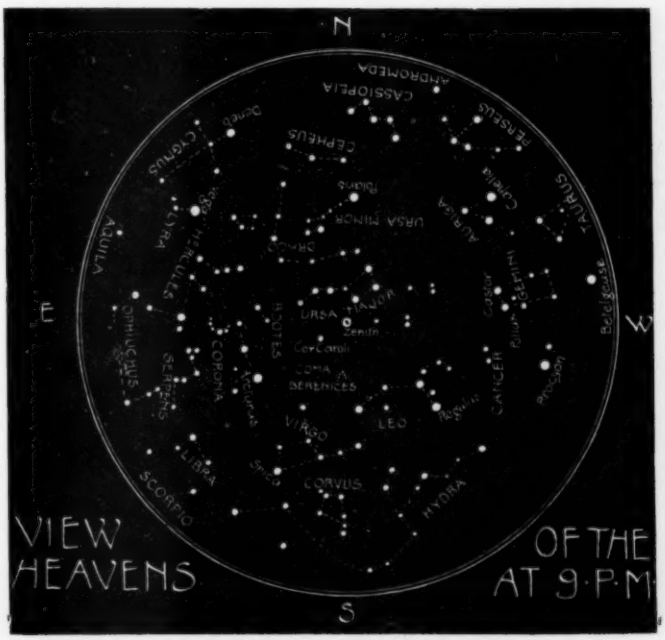
In the **Zenith** will be seen Ursa Major and two other constellations—namely, Canes Venatici (famous for the spiral nebula to be found within it), and Bernice's Hair, which we need do no more than mention, as they are not sufficiently important for detailed study by the beginner.

The **North** presents to our notice Ursa Minor, Cassiopeia, and Cepheus, all of which will be readily recognised, as they form very conspicuous objects.

In the **East** lie Libra and five other constellations—namely, Scorpio, Hercules, Boötes, Corona Borealis, and Lyra, of which we have only as yet studied the zodiacal asterism Libra.

The **South** is bright with Hydra, Corvus, and Virgo, all of which the observer will have no difficulty in distinguishing, from a consideration of previous work.

Finally, the **West** shines with the light of Cancer, Gemini, Auriga, and Leo, none of which constellations are new to us.



STAR MAP NO. VI. (MAY).

Scorpio is the eighth constellation of the zodiac. Its bright particular star is Antares (from *anti*, "opposed to," and *Ares*, "Mars"), so called because of its ruddy colour, in which respect it resembles Mars, the fiery planet, and from its brightness, which is spoken of as rivalling that of Mars. Scorpio will be found low down on the south-east, but Antares will be below the horizon at 9 p.m., although he may be seen at midnight. Next month it will be possible to examine this beautiful first-magnitude star with greater ease. The lower stars of Scorpio never rise above the horizon.

Hercules lies between Vega and Corona Borealis, with which we shall deal presently. The constellation has the form of a great lily, the stalk of which, after bending under the crown, slopes upwards towards the left, and opens its cup towards Vega. It is towards the constellation Hercules that the sun is moving forward with all his attendant planets. To recognise the kneeling Hercules, the constellation, as seen in the Northern Hemisphere, must be turned upside down. The three stars next to Vega represent the bent left leg of the giant, whilst the other limb of the cup of the lily forms the fancied right leg.

Boötes (The Herdsman).—The tail of the Great Bear points to a beautiful lozenge-shaped cluster of stars, of which the star forming the lowest angle to the right is a first-magnitude star. This is the dazzling Arcturus, the cynosure of the constellation Boötes, or the Herdsman, which is visible in our latitudes from April to September.

Corona Borealis (The Northern Crown) is a semicircular cluster of stars lying to the north-east of Boötes. On a dull evening only one bright star may be seen, but on a clear night the semicircular cluster will be plainly visible.

Lyra.—This constellation has for its cynosure the dazzling white **Vega,** one of the most important of first-magnitude stars. Vega may easily be found, since it forms the apex of a large triangle of which a line joining Polaris and Arcturus is the base. Vega is conspicuous on account of its whiteness, in which respect it contrasts very strikingly with the ruddy Antares. It will be noticed that just as Capella (α Aurigæ) is conspicuous in the large space *towards* which the Plough appears to be going, so Vega shines conspicuously in a similar large space *from* which the Plough seems to be coming—that is, Vega and Capella are in opposite parts of the heavens. In fact, taking the Pole Star as centre, Capella, Vega, Cassiopeia, and Ursa Major are almost symmetrically placed in a circle round it. The other stars of the constellation Lyra are two third-magnitude ones and ten others between the fourth and fifth magnitudes.

Eclipse of the Sun.—The great astronomical event of the year is the eclipse of the sun which takes place on the 28th of May. The eclipse is total in Algeria, Spain, and Portugal, but is only partial in the British Islands. About two-thirds of the whole disc of the sun will be obscured. Contact takes place at 2.47 p.m. at Greenwich, and lasts until 4.57 p.m. The zone of totality commences in the Pacific, traverses Mexico and the United States, and enters Europe to the north of Portugal, near Oporto. Passing over Spain, it leaves that country between Alicante and Murcia, and passes over Algeria to the Red Sea. No student must omit to carefully observe this striking phenomenon. Of course, the sun must not be looked at with the naked eye; but a piece of smoked glass will suffice as protection for the eye, although better results will be obtained if a telescope provided with a dark eye-piece is employed. Immediately after the eclipse it will be wise to write down everything that is observed, and then afterwards compare this with what is written in the newspapers concerning the event.

The Planets.—Venus is an evening star in Gemini, and is visible until nearly midnight, as she sets about four hours after

the sun in the middle of the month. On the 2nd of May and again on the 31st she is near the moon.

Jupiter, the giant planet, is in opposition on the 27th, but as he is very poorly placed for observation in Britain, it will be useless to waste time in a hopeless search. He is a morning star in Ophiucus, and near the moon on the 15th inst.

Mercury, on the 30th inst., is in superior conjunction with the sun, but there is not much hope of seeing the messenger of the gods. He is in the constellation Aries.

Mars is in Pisces, and rises about an hour before the sun.

Saturn is in the constellation Sagittarius, and is visible till sunrise.

OPTICAL MEASUREMENTS.

BY A TEACHER OF PHYSICS.

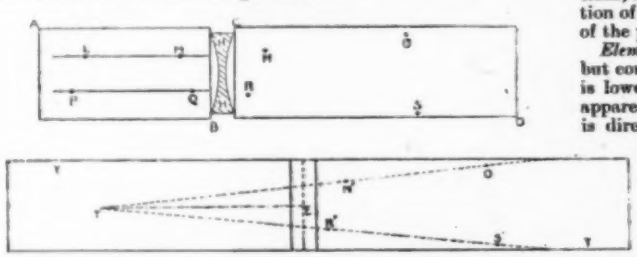
THE following methods of making measurements in light have been used in our physical laboratory with great success. They admit of great accuracy, are easily carried out, do not require any dark room, and can be used by classes of thirty students working at one time.

Focal Lengths of Lenses.

1. For boys and girls of fourteen years the measurement of the focal length of a concave lens presents great difficulty when using the ordinary optical bench method. The method we have adopted will be described in full.

Place the lens upright on a table. Arrange two sheets of cardboard, AB, CD, horizontally, at a level with the centre of the lens, by means of wooden blocks. On AB draw two parallel straight lines at approximately equal distances on each side of the centre of the lens, and at right angles to the central vertical plane of the lens. On these straight lines place two pins, LM, PQ, as shown. On CD place pins NO in a straight line with LM, *as seen through the lens.* Similarly, place RS in a straight line with PQ, as seen through the lens.

Then LMNO, PQRS represent two rays of light from L and P, which are incident on the lens in parallel directions, and suffer refraction through the lens.



Remove the card CD, and on a longer sheet mark the positions of the pins NO, RS, as shown at N′O′, R′S′. Join O′N′, S′R′ respectively, and produce backwards to meet at T. T is the principal virtual focus of the concave lens.

To find focal length, mark on the card the rectangular gap in which the lens was placed. The distance from T to the centre of the rectangle gives the focal length TE.

With lenses of focal length 12 inches, the total length of cardboard used was about 24 inches. It was found better to have the distances LM, NS as great as possible.

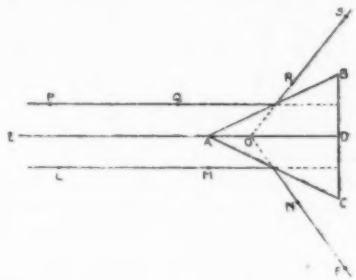
2. In the case of *convex* lenses the lines NO, RS intersected on the sheet CD, and thus the work was somewhat simplified.

Focal Lengths of Mirrors.

The same method was adopted in the case of concave and convex mirrors, the mirror taking the place of the lens.

To find the Angle of a Prism.

Draw a plan of the triangular base of the prism on a sheet of cardboard. Draw a line DAE bisecting the base and angle of the triangle. At equal distances on each side of A draw two straight lines parallel to DAE, meeting the sides of the triangle. Place the prism in position, and fix pins upright on the parallel lines at PQ, LM, as shown. A ray of light passing along PQ will suffer *reflection* at the face AB.



Place pins R and S to appear in a straight line with Q and P, as seen through the face of the prism. Repeat as regards LM. Remove the prism, join SR, FN, and produce backwards to meet at O. The angle RON will be found to be double the angle of prism.

The lines PQ, LM represent two parallel rays, and the theory can then be obtained from any text-book on optics.

Some difficulty may perhaps be found in seeing the images of PQ, etc. Remember that PQ makes a very acute angle with AB, and consequently RS will make a very acute angle with AB.

Accuracy of working may be tested by noting that PQ, SR meet on the side AB of the prism.

The whole of the above exercises have been worked by classes of boys aged thirteen or fourteen years.

NOTES ON ADVANCED AND HONOURS PHYSIOGRAPHY.

Examiners' Report.—In view of the approaching examinations, it will be profitable to spend a little time in the consideration of what the examiners have to say concerning the working of the papers set in May and June last.

Elementary Stage.—A distinct improvement is reported here, but complaint is still made that "the percentage of good papers is lowered, owing to schools being sent into the examination apparently without any real teaching at all." Special attention is directed to the following matters: (1) **Specific gravity,** with respect to the specific gravity of water, and more especially as to buoyancy or upward pressure as the cause of the decrease in weight of a solid when weighed in water as compared with its weight in air. Also, "not a few divided one weighing by the other," instead of by the loss of weight in water. (2) **The blackening of copper when heated in air.**—This was attributed to the deposition of carbon or soot, "and it is imputed that in about two-thirds of the schools the experiment had not been performed." (3) **The bulb of a thermometer.**—The use of this as a reservoir was ill understood; and equal ignorance was shown with respect to the causes that prevent the indications of a thermometer from being accurate. In this connection one examiner says: "I would suggest to teachers, when giving a lesson on the thermometer, to show the following experiment. Take a long tube closed at one end, and a similar tube open at both ends, but with one end inserted in the mouth of a Florence flask. Now fill both to the same height with coloured water, and place a spirit lamp below each, calling attention to the wide range of movement in the one case as compared with the other. The effects of the expansion of glass may be shown in the same experiment if attention is drawn to the slight fall in the liquid upon the application of heat. (4) **Rain gauge.**—What rainfall is represented by 6 cubic inches of rain in a gauge where funnel is 24 square inches? Here it was not understood that $24 \times \frac{1}{4} = 6$ cubic inches—a matter of no surprise to teachers who know how artificial is the knowledge of the pupil as to square and cubic measure. (5) **The meaning of section** was not understood when candidates were asked for a section of fringing, barrier, and encircling reefs.

Advanced Stage.—"A marked improvement" is noted; but weakness was observed with respect to: (1) **Radiation and the formation of hoar frost**—the latter being still spoken of as frozen dew. (2) **Salinity of the ocean.**—The action of rivers

in bringing large quantities of fresh water was not clearly apprehended, and extravagant effects were in some cases attributed to the action of organisms. (3) **Anticyclones** were not well grasped, but this is due to the text-books, which do not allude to the *movements in a vertical direction*. (4) **Substances present in springs** were not known. "Nothing more exact than 'salts' was usually given; lime, iron, and 'minerals' were spoken of as present in it, and the action of CO_2 was seldom referred to." (5) **Volcanoes.**—Instances of paroxysmal, constant, and alternate, were asked for in vain, and "the answers show that the teaching about volcanoes is confined to a very few typical examples, and that beyond these the knowledge of the candidates has not been extended by reading."

Honours papers, with one or two exceptions, "show such a want of grasp of the questions treated of as to lead to surprise that the papers were ever attempted by the candidates. Very few candidates show any knowledge both of astronomical and zoological questions, and the larger proportion of the papers score only a small minority of marks."

Dust Particles as Centres of Condensation.—Mr. John Aitken, whose eminent services in connection with the question of cloud and fog and dew formation no physiographist should be ignorant of, writes a letter to *Nature* (March 29), which we venture to quote *in extenso*, on account of its great interest to students of physiography.

Wilson's Theory of the Causes of Atmospheric Electricity.—"From a paragraph in the 'Notes' in *Nature* of 1st March," writes Mr. Aitken, "it will be seen that the theory advanced by Mr. C. T. R. Wilson of the Cavendish Laboratory, Cambridge, and recently supported by Elster and Geitel, of the origin of atmospheric electricity is gradually crystallising and becoming accepted, as might be expected when supported by such authorities. This theory is founded on the very beautiful and interesting experiments of these investigators, which show that there are ions in our atmosphere, and that these ions can form nuclei for the condensation of water vapour; and, further, that the negative ions become centres of condensation with a less degree of supersaturation than the positive ones, and, consequently, during condensation they will be the first to be carried down by precipitation, the positive ions being left in the atmosphere.

Dust Particles prevent Supersaturation.—"Before meteorologists accept this explanation of atmospheric electricity there are some points I would like to place before them for their consideration. These ions do not act as centres of condensation unless the air be highly supersaturated, whilst dust particles are active in saturated air, and some of them in air that is not quite saturated.

Is Air supersaturated?—"Mr. Wilson is evidently conscious of this difficulty, so he adds a note to the end of his paper, in which he states there is no evidence of supersaturation in the atmosphere: but he also says there is an equal lack of evidence against its existence; and while admitting it cannot exist in the lower dust-charged layers of the atmosphere, he is reluctant to give up the theory on that account, and supposes it may be possible that dusty air may be purified of its dust as it ascends, by the dust particles being weighted by the vapour condensed on them, when they will fall, or the air may rise up through them and be dust free when it escapes.

What is learned by being in the Clouds.—"Now any one who has been in the clouds, or knows the slow rate at which cloud particles descend, will be aware that this process is an extremely slow one, and, compared with movements of the cloud as a whole, very insignificant. But suppose we give the cloud every chance to get free from its dust particles, let it be kept quite still and free from eddies, and time allowed for all the water particles to fall out of it. Now what would be the condition of the air afterwards? Practically what it was before the cloud was formed. There would be a smaller number of dust particles in the air, but there would still be plenty to form a number of clouds in succession if the vapour supply was not exhausted.

Myriads of Dust Particles in Air.—"When a cloud forms in ordinary impure air only a small proportion of the dust particles become active centres of condensation, whilst many receive no charge of vapour. On the Rigi Kulm I have counted as many as 3,000 or 4,000 dust particles per cubic centimetre in clouds, and on one occasion as many as 7,700 in a dense cloud; whilst in fog, which we may call a low-level cloud, I have observed as many as 50,000 dust particles per cubic centimetre. With thousands of dust particles in each cubic centimetre, it is evident a cloud has dust nuclei sufficient for making a number of clouds should the first-formed cloud particles be precipitated, as these dust particles will move with the air, whilst the cloud particles fall out.

Enough to condense the Whole.—"No doubt clouds do not always have such large numbers of dust particles in them as the clouds above referred to, but cumulus clouds seem to be always pretty well supplied in that way, especially over continental areas. Then, as the quantity of water to be condensed is limited to the amount the cloud takes up with it from the surface of the earth—as it is not likely to have any vapour added to it unless it falls below the rain-cloud level—there seems generally to be enough dust particles to condense all the water. We must further remember that nature is economical in its use of these dust particles. If the cooling is taking place very rapidly, a large number of particles at once become active; but after a time a number of them lose their load of water by drying up, and only a sufficient number to do the work being retained on duty the others go to the reserve.

Dust Particles may be manufactured.—"It may be also as well to remember that even supposing all the dust to be precipitated out of the air, nature may be able to manufacture fresh supplies. If there are any gaseous impurities in the air, such as ammonia, nitric acid, nitrous acid, peroxide of hydrogen, sulphurous acid, sulphuretted hydrogen, hydrochloric acid, or chlorine, the sunshine will convert them into nuclei, which do not require a high degree of supersaturation to make them active centres of condensation.

Ions might form Rain but not Clouds.—"There is another point in connection with condensation by means of ions which may be referred to here. It does not seem probable that ions could ever cause the formation of a cloud, though they might give rise to rain. If the air becomes so supersaturated as to make them active centres of condensation, it will then be in an unstable condition. It will, in fact, be in an explosive state—explosive centripetally and not centrifugally as usual. Whenever any ion, in air in that condition, owing to any advantage of its constitution, or to difference of temperature, pressure, or saturation in the surrounding air, becomes active before the others, it will grow extremely rapidly, and at once begin to fall; and as it will fall through highly supersaturated air, it will relieve the tension all along its path, and so grow rapidly, and soon become a raindrop, and fall to the earth.

No such Thing as Dust-free Air.—"So far as our knowledge goes, it can hardly be said that there is such a thing as dust-free air in our atmosphere, and the cases in which low numbers have been observed are so extremely rare that they can hardly have any bearing upon a phenomenon of such widespread existence as atmospheric electricity, even though we suppose these few particles to be afterwards got rid of. We cannot suppose the positive ions will remain always in the atmosphere, because if the conditions are ever such as to cause the fall of the negative ions the positive ones will also afterwards fall with only a slightly greater increase in supersaturation."

CHEMISTRY NOTES.

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.),

First Class Honoursman in Chemistry.

Examiners' Report.—(A) *Theoretical:* 1. *Elementary.*—Satisfaction is expressed with the work in this stage; but teachers will act wisely in enjoining their students to carefully read the questions, since the examiners deplore the number of students who failed to do themselves justice through neglect of this precaution. For the rest—(*a*) **comparison** is not enumeration, as some students failed to note; (*b*) **CO_2** is not the only gas that gives a precipitate with lime-water, and more than one character should be given in identifying a gas; (*c*) **actual experiments** in determining the densities of gases should be performed; and (*d*) students should be warned against using a **formula for air**, as "this is always punished severely in the award of marks."

2. *Advanced.*—The teaching is said to be very bad indeed here. (*a*) **Salts not prepared.** It appears that there were many "attempts to trick the examiners," such as the description of the decomposition of steam by red-hot copper, and the preparation of crystals of copper sulphate by the evaporation of the liquid produced by boiling copper in sulphuric acid, and the equally foolish preparation of silver nitrate from the chloride by dissolving it in ammonia and adding nitric acid. (*b*) **Elementary work** is forgotten, so that the preparation and properties of ammonia were better known by the elementary students than by the advanced. (*c*) **Higher hydrides of nitrogen.** "Scarcely one in a hundred had heard of these compounds." (*d*) **Molecular composition.** "The reasons for representing the molecule of hydrogen by the formula H_2, and the molecule of oxygen by

O_2, were quite above the level of most of the students." And (*c*) **Equations** are made without knowledge—such as, $KI + O_3 = KIO_3$, and $BaSO_4 + 2\,HNO_3 = Ba(NO_3)_2 + H_2SO_4$.

Honours (*Part I.*).—Papers are bad, and so, apparently, are the text-books used, since, in the definitions of acid, base, and salt, no mention is made of electrolysis in any single paper.

Honours (*Part II.*).—A great improvement is noted, but still "much more experience, both in the laboratory and in reading, is necessary before the proper standard is reached by the majority of the students."

(B) *Practical*: 1. *Elementary*.—Results were generally fair. The chief weakness was inability to recognise carbon, which will probably, in some form or other, be given for identification in the forthcoming examination.

2. *Advanced*.—(*a*) **Equations** were badly done, and common-sense was lacking in dealing with the quantitative work—some students finding, for example, more than a hundred per cent. of copper in the alloy given for examination! (*b*) **Written examination.** Many thought that in order to try whether a bar of lead would mark paper it must first be heated on charcoal with sodium carbonate! (*c*) **Steam ovens** appear to be lacking in some laboratories.

Honours (*Part I.*).—The copper alloy set for determination qualitatively and quantitatively was done badly. Most students found only two constituents, and the quantitative results obtained showed defective methods.

Honours (*Part II.*).—Inexperience in the preparation of bodies and in the enumeration of gases are imputed as general faults in this stage. Only one student found titanic oxide in the iron ore given for examination, and nearly every one found silica, which was only present in minute quantities.

Teachers will act wisely in bringing these defects specially under the notice of their students, as it is morally certain that the work set in May will be so framed as to see whether the same weaknesses still exist.

Compounds of Fluorine.—We have already drawn attention to the preparation (by Moissan) of fluorine in a copper voltameter, as opposed to the more expensive platino-iridium U tube. As a result, large quantities of the gas have been cheaply available, and M. Moissan has already taken advantage of this fact to produce the magnesium compound. The gas was found to react readily with powdered manganese, and the compound formed was, upon examination, found to be mainly the higher fluoride MnF_3; but by reason of the violence of the reaction, the composition was not constant. By reacting upon fluorine with manganeous iodide, a definite fluoride, corresponding to the formula Mn_2F_6, was obtained, which body was found to react in many ways just as though it were the element fluorine itself. For example, with phosphorus pentochloride it forms PF_3, and forms with amorphous carbon a fluoride of carbon. Heat decomposes it in accordance with the following equation:—

$$Mn_2F_6 = 2\,MnF_2 + F_2.$$

Effect of Nascent O on CO.—In a contribution to the Chemical Society, Mr. Russell shows that the nascent condition has no great effect upon the combination of these two bodies. CO and O were brought together in the flame of an explosion; yet the combustion was rarely complete, the amount of unburnt gas being much the same as when dried O and CO were fired by adding CS_2 and O, and sparking. The substances used to supply the bodies in the nascent state were carbonyl sulphide and nickel carbonyl on the one hand, and hypochlorous anhydride (Cl_2O) and chlorine peroxide (ClO_2) on the other.

Crystallised Calcium.—M. Moissan has obtained this by dissolving Ca in liquid sodium, kept at a dark-red heat. On cooling, the calcium crystallises out, and by treating the metallic mass with absolute alcohol, brilliant white hexagonal crystals of pure calcium are obtained.

Percarbonates (S. Tanatar).—By reacting with hydroxyl (H_2O_2) on Na_2CO_3 and K_2CO_3, the author has succeeded in obtaining percarbonates of sodium and potassium, which, when heated to 100° C., do not give off oxygen. The sodium percarbonate contained in aqueous solution gradually decomposes to H_2O_2 and Na_2CO_3; when an acid is added, there is a disengagement of CO_2, and the solution contains H_2O_2, which can be extracted by means of ether. To be quite sure that he was not dealing with a mixture of Na_2CO_3 and H_2O_2, the author determined the heat of decomposition of the salt by nitric acid, and found that the number of calories—namely, 7·21 to 7·26—was higher than that required for the decomposition of H_2CO_3—namely, 5·33 calories. H_2CO_4 is thus a weaker acid than H_2CO_3.

A Valuable Hint.—One of the most provoking occurrences in a chemical laboratory is the shattering of a hydrogen generating apparatus upon attempting to ignite the jet of hydrogen. Not only does the apparatus perish, but the beginner is often unnerved, and chemistry is regarded as a most dangerous pursuit. Hence it is with great satisfaction that we draw attention to the following means of obviating these explosions, for which we are indebted to Mr. Hopkins, who writes in *The Journal of the American Chemical Society* to the following effect:—"As soon as the action begins, collect the escaping gas in a test-tube; and when it is thought to be full of the pure gas, remove the test-tube two or three feet from the generator, and ignite the hydrogen that is contained therein; then immediately *attempt* to light the jet of hydrogen *with the hydrogen flame contained in the test-tube*. If the gas is explosive, it will explode in the test-tube, and leave no flame. If, on the other hand, a flame remains in the test-tube, with which the jet can be ignited, it is certain that the gas in the generator is no longer explosive. Hence the caution—Never light the hydrogen jet except with the hydrogen flame, obtained as just described. The student may try to ignite the jet by this method as often as he wishes until he succeeds, and if the hydrogen is properly generated, he will succeed in less than a minute." We may add that we have put Mr. Hopkins's method to the test, and we find that it answers admirably.

Volumetric Composition of HF.—Hydrogen combines with fluorine in the dark to form HF with the evolution of 38·6 calories; but the reaction is too violent for good measurements to be made whereby the volumetric composition of HF can be determined. Hence the following method has been devised by M. Moissan, the isolator of fluorine. A known volume of fluorine is allowed to act on water, and the volume of oxygen produced is accurately measured:—

$$H_2O + F_2 = 2\,HF + O.$$

The oxygen is found to be strongly ozonised. As a result of a series of experiments, it was found that one volume of fluorine combines with an equal volume of hydrogen to give double the volume of hydrofluoric acid.

How Saltpetre is formed.—Professor Warrington, F.R.S., delivered before the Chemical Society, on March 8, an interesting lecture on "Recent Researches in Nitrification," from which we extract the following:—"During recent years the chief investigations in the character and properties of the nitrifying organisms have been carried out in Winogradsky's laboratory in St. Petersburg. It had previously been found that the process of nitrification consisted of two distinct stages of chemical work, effected by two agents which could be separated from each other. By the first (the nitrous organism) ammonia was converted into a nitrite; by the second (the nitric organism) the nitrite was oxidised to nitrate. Winogradsky has examined soils from many parts of the world. He finds but one nitrous and one nitric organism in any soil. The nitric organism is everywhere the same species. The nitrous organism may vary. Winogradsky had proved by quantitative experiments that the nitrous organism derives its carbon from CO_2; the nitric organism possesses the same power. As both organisms flourish in darkness, the energy necessary for the construction of organic matter out of carbon dioxide and water is apparently derived from the oxidation respectively of ammonia or of a nitrite. Later experiments have shown that the carbonic acid is in every case probably taken from supercarbonate. It appears that nitrifying organisms are without action upon nitrogenous organic matter, which must first, by the agency of other organisms, if necessary, be brought into the form of ammonia, which is converted by the nitrous organism into nitrite, and by the nitric organism into nitrate.

NOTES ON THEORETICAL MECHANICS.

BY F. CASTLE, M.I.M.E.,

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ADVANCED AND HONOURS STAGES.

THOSE of our readers who intend to take up the examination papers in "Solids" and "Fluids" will, we hope, be quite ready when this reaches them; but in the brief interval that remains, it will probably be found best to give all the time that can be spared from other work to write out on a blank sheet of paper the more important parts of the subjects. In addition to this, at the examinations it is advisable to carefully read over the given questions, to ensure that what is required to be done is carefully made out; also to take care that no more than the requisite number of questions is attempted.

Sphere under internal pressure.—In the case of a sphere subjected to internal pressure, and assumed to be made of some *thin* material, the consideration of the tensions in the surface produced by the pressure of the enclosed fluid is of great importance—the formula obtained applying not only to the case where metal of some kind is the material used, but also to the surface tension of a soap bubble. At the outset it may be advisable to briefly recapitulate the corresponding case of a thin cylinder.

Assuming a diametral plane, therefore, cutting the cylinder along two generating lines, the area of the plane is $2r \times l$, where r is the radius, and l the length of the cylinder: if p denote the internal pressure, the magnitude of the resultant pressure on the rectangle is $p \times$ (area of rectangle) $= p \times 2rl$.

This force is balanced by the parallel forces furnished by the edges of the rectangle; the magnitude of each is $t \times l$, where t denotes the tension per unit length.

Equating, we have $p \times 2rl = 2tl$.

$$\therefore t = pr \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

If T denote the thickness of the cylinder, and f the tenacity of the material of which the cylinder is made, then the greatest tension at the surface which can be furnished by the material is Tf.

$$\text{Hence } pr = Tf,$$

$$\text{or } p = \frac{Tf}{r} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

In the corresponding case of a *sphere* of radius r, a diametral plane would be a great circle of the sphere; its area would be πr^2. If, as before, p denote the internal pressure, then the magnitude of the resultant pressure will be $p \times \pi r^2$.

If t denote the tension per unit length, then at every point along the circumference of the great circle there will be tensions perpendicular to the plane of the circle; the resultant of all the tensions across this circle will be $t \times$ (circumference of circle) $= 2\pi rt$.

$$\text{Hence we have } 2\pi rt = \pi r^2 p.$$

$$\therefore t = \tfrac{1}{2}pr \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

As before, denoting the thickness by T, and the tenacity of the material by f.

$$\text{Then } p = \frac{2Tf}{r} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (4)$$

Comparing (1) and (3), it is seen that the tension per unit length in a cylinder is twice as great as in the case of a sphere of the same radius, and subjected to the same internal pressure; and similarly, comparing (2) and (4), the bursting pressure for a sphere is double that for a cylinder of the same radius and made of the same material.

To ascertain the tension per unit length, in a circumferential direction, in a cylinder of radius r, we have a similar result to that obtained for a sphere. This may be shown as follows:—The area of one end of the cylinder will be πr^2, and therefore resultant force in the direction of the axis of the cylinder is $p\pi r^2$. This is balanced by the tensions along the circumference of a circle $= 2\pi rt$, where t is the tension per unit length.

$$\text{Hence } p\pi r^2 = 2\pi rt.$$

$$\therefore t = \frac{pr}{2}.$$

Thus the tension per unit length in a circumferential is one-half that in a longitudinal direction.

Soap Bubble.—In a soap bubble the inside pressure must necessarily be greater than the external pressure, to balance the surface tension of the film, which tends to make the bubble contract. If p denote the excess of the internal over the external pressure, and r the radius of the sphere, then, as before, an imaginary plane passing through the centre of the sphere will cut the sphere in a great circle, the area of this imaginary plane will be πr^2, and the magnitude of the force will be $p \times \pi r^2$.

If t is the tension per unit length along the circumference of the great circle, then the total tension on the *outside* of the film will be $t \times 2\pi r$; but there will also be a corresponding surface tension from the inside of the film: thus the total force will be $2t \times 2\pi r = 4\pi tr$.

$$\text{Hence } p \times \pi r^2 = 4\pi tr.$$

$$\therefore p = \frac{4t}{r} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (5)$$

From (5) it follows that the surface tension can be ascertained by estimating the internal pressure and the radius of the bubble; also that the internal pressure diminishes as the bubble gets larger—that is, as r increases.

Ex. 1. Find the tension at any point of a thin spherical envelope subject to internal fluid pressure.

The tensile strength of a metal is 16,000 lbs. per square inch: find the fluid pressure per square inch that will just burst a spherical vessel made of that metal—the radius being a foot, and the thickness of the metal being a tenth of an inch. (1898.)

From Equation (2), where $T = \frac{1}{10}$, $f = 16{,}000$, and $r = 12$, we have—

$$p = \frac{2 \times \frac{1}{10} \times 16{,}000}{12} = \frac{32{,}000}{120}$$

$$= 266\tfrac{2}{3} \text{ lbs. per square inch.}$$

Ex. 2. A bar of metal whose cross section is a square inch is suspended by one end, and can just support a weight of 12,000 lbs. hanging from the other end of it; a hollow sphere, whose radius is one foot and thickness one-fifth of an inch, is made of the metal: find the internal fluid pressure that will just burst it. (1895.)

From Equation (4) we have, as $T = \frac{1}{5}$, $f = 12{,}000$, and $r = 12$—

$$p = \frac{2 \times \frac{1}{5} \times 12{,}000}{12} = \frac{24{,}000}{60}$$

$$= 400 \text{ lbs. per square inch.}$$

Ex. 3. Prove that when a thin spherical shell is exposed to the bursting pressure of a fluid, the stress in the material is half as great as that within the curved surface of a thin cylindrical shell exposed to the same pressure, each shell being of the same thickness and diameter. (1899.)

Ex. 4. If a circular cylinder of metal, of radius r, be subjected to an internal pressure p, determine the magnitude of the circumferential pull per unit of length acting across a longitudinal section of the cylinder.

If a cylindrical boiler is made with hemispherical ends, prove that these ends need have only half the thickness of the cylindrical shell, but that they will weigh the same as flat ends of the same thickness as the shell. (1899.)

Ex. 5. A soap bubble has a certain internal pressure p when the atmospheric pressure is P: find an equation for determining the internal pressure when the atmospheric pressure changes to P^1. (1897.)

ELECTRICITY AND MAGNETISM.

NOTES ON ADVANCED AND HONOURS STAGE.

BY EDWIN EDSER, A.R.C.S., F.PH.S.

A FEW hints as to the best course to be followed in answering questions may be of service to students about to sit at the forthcoming examination in electricity and magnetism.

In the first place, the student is advised to resist any tendency to hurry over his answers. Ample time is allowed for the questions set to be answered fully, and any undue haste is likely to lead to errors which might otherwise easily be avoided.

Read the instructions carefully, noting the number of questions to be attempted in each section. It is then well to read the questions through carefully, ticking off those which can be answered. Do this systematically, remembering that final success will largely depend on this part of the work.

Having marked the questions which you can answer, select in each section the one that presents to you the smallest amount of difficulty, and answer these first. Remember that a simple question answered satisfactorily will bring you more marks than a more difficult one answered imperfectly.

It is well to start with numerical examples. It must be remembered that correct working and a correct result to a numerical example will bring you full marks; it is often hard to ensure that you should get full marks from answering any other form of question.

In all cases where it is possible, draw a diagram explaining your answer. Let the diagram be as large as possible, and carefully letter it. Do not waste time in making elaborate drawings: the questions set will generally refer to some general law of electricity, or some simple deduction from such a law, and your diagram should explain your answer, *and no more*.

If you use symbols, make a list at the head of your answer of the meaning of the symbols you employ. If you assume any relation between these symbols, write this down also.

Make your answers as brief as possible, taking care that you answer each question fully. *Do not, on any account, make any reference to points which are not mentioned in the question.* At the same time, if you can prove a relation from first principles, it is better to do so than to make assumptions.

The following model answer may be of service to the student:—

Question.—A Leyden jar consists of two concentric spherical surfaces of 5 and 6 cms. diameter respectively, the intervening space being filled with air. The outer sphere is uninsulated;

the inner is charged with 20 units of electricity. How much work is done when the inner sphere is put to earth?
(S. and A. Adv., 1895.)

Answer.—Since the outer spherical surface is uninsulated, we may consider it to be connected with the earth. When the inner spherical surface is also connected with the earth, the two surfaces will be connected together, and the Leyden jar will be discharged. The work done will be equal to the work performed in charging the Leyden jar.

Let V be the potential of the Leyden jar when charged with 20 units of electricity. During the charge, the potential increases from 0 to V. Since the work performed during charging is equal to the *average potential*, during that process, multiplied by the charge communicated, we have—

$$\text{Work performed during charging} = \frac{V+0}{2} \times 20 = \frac{V}{2} \times 20 = 10V.$$

To determine V.—The potential, at any point outside a charged sphere, is the same as that due to a charge equal to that carried by the sphere, but concentrated at the centre of the latter.

Each point on the outer spherical surface will be at a distance of $\frac{6}{2} = 3$ cms. from the centre of the inner sphere, and each point on the inner spherical surface will be at a distance of $\frac{5}{2} = 2{\cdot}5$ cms. from the centre.

Then *difference of potential* between two points, at distances of 2·5 and 3 cms. respectively, from a charge of 20 electrostatic units

$$= \frac{20}{2{\cdot}5} - \frac{20}{3} = \frac{10}{7{\cdot}5}.$$

Since the outer sphere is connected with the earth, its potential = 0. Hence difference of potential between inner and outer sphere = potential of inner sphere = $V = \frac{10}{7{\cdot}5}$.

Finally, work performed in charging condenser = $10V = \frac{100}{7{\cdot}5}$.

Question.—Define unit magnetic pole and unit electrical current in the electro-magnetic system, and state the relation of the ampere to the latter. (S. and A. Adv., 1895.)

Answer.—The magnitude of a *unit magnetic pole* is such that if it be placed in air at a distance of one centimetre from another equal pole, the force exerted between the two is equal to one dyne.

Unit C.G.S. current is thus defined in the electro-magnetic system:—

If unit current flows round a ring of wire of one cm. radius, then a unit pole placed at the centre of the ring will be acted upon by a force of 2π dynes.

The *ampere* is the unit of current in practical use. In magnitude it is equal to one-tenth of the theoretical unit defined above. Thus 10 amperes = 1 C.G.S. unit.

Questions are now occasionally set in which the student is required to discuss a certain statement, or to write an essay on a certain subject. In attempting such questions, the student should attend to the following points:—

A statement of a number of facts does not constitute a discussion. To discuss a point, the student is expected not only to clearly state the inferences which have been drawn from the experimental data referred to, but also to criticise these inferences, referring to any cases in which they are not valid, etc. The marks for an answer to a question such as this will not entirely depend upon the extent of the information given, but also on the reasonableness of the arguments adduced. Thus correct reasoning, even when based on unsound knowledge, will carry *some* marks.

The best course of procedure is:—

1. To state the facts of the case, as far as you know them.

2. To state the inferences which have been drawn from the facts, paying special attention to any inference suggested in the question.

3. To point out how far, in your opinion, such inferences are valid, and to mention any other inferences which you consider might be deduced from the same facts. Mention any further experiments which might be performed to confirm or refute the inferences mentioned.

In writing an essay, it must be remembered that marks will be given for the literary style exhibited. Literary style does not, however, consist in using imposing language. The first essential for your success is that you should have something to say; the next is, that you should say it in the clearest and at the same time the simplest and most graceful manner. Avoid everything in the nature of repetition, and never use two words where one will suffice. Some students cultivate a vicious habit of prefixing an adjective to every noun they use. The writing of many eminent men shows this blemish. As an example, we may take Gibbon's *Decline and Fall of the Roman Empire*. The addition of unnecessary words produces a most unpleasant sensation of fullness in the critical reader, even if it does not create an impression of untruthfulness and exaggeration.

In an essay, your chief care should be to secure clearness of expression, and to use this in developing connected thoughts. Care should be taken in punctuation, and sentences should be made as short as possible.

Scientific Terms.—Be very careful in your use of scientific terms. In electrostatics, especially, many students use the terms "potential" and "difference of potential" in a loose way that has more than once called for a remark from the examiners. The following definitions and laws should be remembered:—

Difference of potential is the work done in moving a + unit of electricity from one point to another. It is naturally measured in ergs. The term "difference of potential" has no meaning unless the two points in space between which the difference is measured are specified.

The *potential* of a point is the work done in bringing a + unit of electricity from an infinite distance up to that point. It is measured in ergs.

The potential of a point, at a distance r from a charge + Q, concentrated at a point, $= \frac{Q}{r}$.

If a charge + Q is distributed over the surface of a sphere, then the potential at a point at a distance r from the centre of the sphere $= \frac{+Q}{r}$, provided r is not less than the radius of the sphere. Thus, if r is the radius of the sphere, the potential of any point on the sphere $= \frac{+Q}{r}$. The potential of all points inside the sphere is equal to the potential of the sphere itself—namely, $\frac{+Q}{r}$.

If a body is positively charged, the potential increases as we approach it. If it is negatively charged, the potential diminishes as we approach it.

Positive electricity tends to flow from points at high to those at lower potential.

In the electro-magnetic system, the term "difference of potential" is applied to the work performed in unit time by unit electric current flowing between two specified points on a conductor. The electro-motive force in a circuit is equal to the total work expended when unit current flows for unit time round the circuit. Thus we speak of the E.M.F. of a cell, but of the difference of potential between points on a wire, or between the terminals of a cell, when a current is flowing through it.

SCIENCE NOTES.

The Chromosphere.—An instrument likely to be useful in schools has been shown to the Royal Society of Edinburgh by Mr. H. B. Blaikie. It is called the chromosphere, and it consists of a terrestrial globe surrounded by a concentric celestial sphere of clear celluloid. By its aid many problems in astronomy and navigation can be demonstrated.

The Uses of Wood-Pulp.—A better poultice than linseed-meal or bread is said to be made from moistened wood-pulp. It absorbs oil or fat, and can be used for salves.

Paris Congresses.—Several congresses are to be held at Paris in connection with the Exhibition. There will be a Congress of Mining and Metallurgy, from 18th to 23rd June; an Ornithological Congress, from 26th to 30th June; a Congress of Philosophy, from 2nd to 7th August; an International Medical Congress, from 2nd to 9th August; and a Congress of Ethnology, from 26th August to 1st September.

Kites and the Atmosphere.—The Aeronautical Observatory of Tegel, in Prussia, is about to employ kites and kite-balloons, carrying self-registering weather instruments, to explore the atmosphere, from 3,000 to 5,000 metres high.

A New Pigment.—An Italian workman, Signor Ceruli, has discovered a new pigment which gives beautiful tints without oil or varnish. It is called cerulline. The French artists have had it brought before them by M. Girard, Preparator to the Faculty of Sciences, Paris.

Root Growth and Nitrogen.—Herr Müller-Thurgau has recently been conducting a series of experiments on the effect of

the growth of plants of an extra supply of nitrogen to the roots. He is of opinion that the roots are enabled to form an abnormally large amount of albuminoids when the nitrogen is presented to them in the form of a nitrate, but only if they can obtain a sufficient supply of sugar. This is shown in the greater length and thickness of the roots, in their greater branching, and in the increased amount of protoplasm in their cells.

Substitutes for Tea in Russia.—The leaves of a species of willow-herb, *Epilobium angustifolium*, are largely used in Russia as a substitute for Chinese tea. They form what is called "Kaporic tea," the manufacture of which is a considerable Russian industry. The leaves of *Epilobium hirsutum* are also sometimes used for this purpose. "Caucasus tea" is manufactured from the leaves of *Vaccinium arctostaphylos*.

The Chemical Constitution of Gymnosperm Tissues.—M. Bertrand has lately been investigating the chemical constitution of the wood of gymnosperms. He found manno-cellulose in the wood of all the cycadaceous and coniferous plants that he examined. Of three gnetaceous plants examined, *Ephedra distachya* gave only a relatively small amount, while *Gnetum thoa* and *Welwitschia mirabilis* contained none. He thinks, therefore, that the Gnetaceæ are not true gymnosperms, but must be regarded as a connecting link between that group and the angiosperms. So much manno-cellulose was found to be present in the other conifers that their wood is suggested as a good source of mannose. On hydrolysis of the manno-cellulose with a 5 per cent. HCl solution, the outer wood of the yew gave 10 per cent. of mannose; the branches of *Abies pectinata*, 8·4 per cent.; and the stems of *Cupressus torulosa*, 3·4 per cent. The wood of all the gymnosperms examined gave but little xylane when treated with caustic soda, after removing the portions soluble in alcohol and water.

The Assimilation of Chlorophyll by Leaves.—In a recent number of the *Comptes Rendus*, M. Griffon gives an account of a series of experiments carried out by him to determine the extent to which the power of assimilation in leaves is affected by the light having passed through other leaves. As a rule, he finds that passing through a single leaf does not greatly affect the power of light to decompose carbon dioxide; but if the light has passed through two leaves, this power is so weakened that respiration becomes more energetic than assimilation. The reduction in the assimilating power resulting from the light passing through a single leaf varies between 1·7 in the case of the beech and 1·20 in the case of the ivy.

The Cereal Rusts of America.—The United States Department of Agriculture has recently issued a bulletin on cereal rusts. Those occurring in America are the orange leaf-rust of wheat, *Puccinia rubigo-vera Tritici;* the orange leaf-rust of rye, *P. rubigo-vera Secalis;* the crown-rust of oats, *P. coronata;* the black stem-rust of wheat and barley, *P. graminis Tritici;* the black stem-rust of rye, *P. graminis Secalis;* the black stem-rust of oats, *P. graminis Avenæ;* and the rust of maize, *P. sorghi*. The black stem-rusts of wheat and rye are the most destructive of these fungi. The uredospores of the orange leaf-rusts of wheat and rye do not appear to attack hosts outside the genera Triticum and Secale, while the black stem-rust of wheat occurs also on barley.

A New Oil.—A new oil, "oil of Chinese wood," is coming into use for making lacquer and waterproof oilcloths. It is extracted from the seeds of a tree called *Aleurites cordata*, which grows in rocky places, especially in the provinces of Hunan, Hupeh, and Szechuen. Oil of Chinese wood can be used instead of linseed oil in painting. It should then first be boiled with a little oxide of zinc, minium, or litharge, the temperature being kept over 200° C.

Musk Oxen in Europe.—Two young musk oxen were brought last year by Captain Gröndhal to Tromsö, in Norway. They came from the north of Greenland, and are the first of the species in Europe. They resemble big sheep, and have become acclimatised in Norway.

A New Cartridge.—The use of dynamite or gunpowder for blasting purposes is likely to be superseded by a new cartridge, invented by M. Tommasi. It consists of a sealed glass tube containing a concentrated solution of carbonate of potassium, and wires through the glass connect with a battery. A current of electricity sent through the liquid decomposes it, liberating hydrogen and carbon dioxide, which accumulate and burst the tube. Chloride of ammonium can be used instead of the carbonate of potassium. These cartridges are only dangerous when the current is put on them.

Hibernation in Winter.—In times of scarcity some Russian peasants in the department of Paskov hibernate like animals. They lie in bed, which is made on a flat stove; and all that is done by them is to replenish the stove, and take a diminished ration of black bread dipped in water, to support life. The hut is kept dark and silent, and they try to keep as immovable as possible, so as not to waste their energy or heat.

The Dissipation of Hail-Clouds.—In the *Proceedings of the Academy of Georgiali, Florence*, an account is given of the dissipation of hail-clouds in Styria by firing conical mortars at them. A new breech-loading quick-firing gun has been substituted for the conical Stigel mortar, and eight hundred firing stations have been established in Brescia to protect the vineyards. Small bombs with time-fuses have been added to the equipment. They reach a height of more than a mile, and their whistling is heard for about fifteen seconds after the discharge.

Pigmy Flint Weapons in East Lancashire and South Yorkshire.—A number of small, neatly-worked flint weapons have recently been found in East Lancashire and South Yorkshire. They were associated with rough, not polished, implements of the New Stone Age, and are like some found in France, Belgium, and Indian caverns.

A Three-Rail Line.—A three-rail line connects Cobourg, Luc, and Caen and other Norman towns, uniting the broad and narrow gauges. The middle rail serves for both gauges, though, of course, two trains cannot pass each other on the two lines. This system is a compromise between the existing broad and narrow gauge lines, enabling them to work in combination.

The Illumination of Rooms.—The illumination of a room partly depends on the reflection from its walls. Black hangings give the lowest rate of reflection—the percentage reflected being, for black velvet, 0·4 per cent.; for black cloth, 1·2 per cent.; for black paper, 4·5 per cent. Next, in an ascending order, are dark blue, 6·5 per cent.; and dark green, 10·1 per cent. The percentage reflected by pale red is 16·2 per cent., and the percentage reflected by dark yellow, 20 per cent. Of the pale colours, pale blue reflects a percentage of 30 per cent.; pale yellow, 40 per cent.; pale green, 46·5 per cent.; pale orange, 54·8 per cent.; and white, 70 per cent. The percentage reflected by mirrors is 92 per cent. Glossy or varnished paint is better than dull paint for purposes of reflection.

The Electric Light and the Paris Exhibition.—Twelve thousand five hundred and fifty-four electric lamps are to be used at the Paris Exhibition. On the grand entrance there will be 12 arc and 3,116 glow lamps. The bridge of Alexander the Third will show 508 large glow lamps. It is interesting in this connection to notice that Professor Langley (the secretary to the Smithsonian Institution, Washington) finds that all existing artificial lights are very wasteful of energy, which is absorbed in the dark infra-red rays instead of yielding visible rays. He has been making experiments on the Welsbach incandescent gas-light. A tunnel on a new electric railway in Paris is to be lighted by electric lamps, switched on and off by the train. They are to be level with the windows, so as to light the inside of the cars. New Edison lamps will be shown at the Paris Exhibition. Edison has invented a new filament for incandescent electric lamps of high tension. It is made of oxides of thorium and zirconium, and subjected to a special preparation to render it conductive.

Japanese Hygiene.—An example in town sanitation is set us by Japan. Teckham, a Japanese town in Formosa, has been condemned by the government on hygienic grounds, and a new town is to be built for the inhabitants.

The Colouring Principles of Leaves.—A. G. Perkin has recently been investigating the question of the colouring matter of leaves. He states that the colouring matter of the leaves of the bearberry and of the logwood, *Hæmatoxylon campeachianum*, is quercetin, which is accompanied by a second substance, probably myricetin, to which the green colour of its alkaline solutions is due. Gallotannic acid occurs in some quantity in the leaves of the logwood. The leaves of *Rhus metopium* contain gallotannin, myricetin, and a trace of quercetin; but the stem of this plant, unlike *R. cotinus* and *R. rhodanthema*, is devoid of colouring matter. The sparing solubilities of acetylmyricetin and ditromoquercetin have been used for the separation of myricetin and quercetin. The leaves of *Robinia pseudacacia* contain a feeble colouring matter—acacetin, $C_{16}H_{12}O_5$. Acacetin is probably an apigenin monomethyl ether. The leaves of *Myrica gale* and *Coriaria myrtifolia* contain respectively myricetin and quercetin.

Electricity as a Cookery Agent.—The Carmelite Brothers of Lower Canada use electricity for lighting, cooking, and heating in their hospice. The current of the Niagara Power Company is conveyed to the hospice by a bare wire, and amounts to 100 horse-power, of which 25 are used for heating purposes. The current is three-phrase, and has an electro-motive force of 2,200 volts, reduced to 110 volts by transformers. It is conveyed by underground wires. Tea, coffee, boiling water, and ovens for roasting and baking, are heated by the electric current. One day the installation had to cook for 250 persons in two hours and a half. Bread was baked in eighteen minutes.

OUR COMPETITION PAGE

OUR FRENCH PRIZE COMPETITION.

Prize Editor—W. T. THOMPSON, B.A. (LOND.), *French and German Honours.*

WE should like to specially direct the attention of our readers to the fact that the Board of Education, in the Syllabus for Certificate Examinations for the year 1901, requires "no set books" for French and German. Students preparing for these examinations, as well as students for London Matriculation, could not do better than attempt month by month the pieces set for translation here. They are from the best authors, and of varied character. A competitor who does not gain a prize can derive considerable benefit from the exercise. A study of the successful competitor's translation, and of our remarks, will help him to see where he might have done better. If desired, his paper can be returned (fully corrected) by enclosing six stamps.—ED.

RULES.

1. All translations should be **posted not later than May 8,** and addressed:—*Prize Editor*, Office of THE PRACTICAL TEACHER, 35 and 36 Paternoster Row, London, E.C.
2. Competitors should cut out and send the Coupon which appears on the Back Wrapper page of the current number.
3. Competitors should adopt a pseudonym, and send name and address written on a separate piece of paper.
4. No competitor may take the prize offered more than once in three months.

FRENCH PRIZE COMPETITION.

A Prize of One Guinea will be given for the best translation into English of the following extract:—

C'est en voyage que les Espagnols reprennent leur antique originalité, et se dépouillent de toute imitation étrangère; le caractère national reparaît tout entier dans ces convois à travers les montagnes qui ne doivent pas différer beaucoup des caravanes dans le désert. L'âpreté des routes à peine tracées, la sauvagerie grandiose des sites, le costume pittoresque des *arrieros* ou muletiers, les harnais bizarres des mules, des chevaux et des ânes marchant par files, tout cela vous transporte à mille lieues de la civilisation. Le voyage devient alors une chose réelle, une action à laquelle vous participez. Dans une diligence ou sur un chemin de fer, l'on n'est plus un homme, l'on n'est qu'un objet inerte, un ballot; vous ne différez pas beaucoup de votre malle. On vous jette d'un endroit à un autre, voilà tout. Autant vaut rester chez soi. Ce qui constitue le plaisir du voyageur, c'est l'obstacle, la fatigue, le péril même. Quel agrément peut avoir une excursion où l'on est toujours sûr d'arriver, de trouver des chevaux prêts, un lit moelleux, un excellent souper et toutes les aisances dont on peut jouir chez soi? Un des grands malheurs de la vie moderne, c'est le manque d'imprévu, l'absence d'aventures. Tout est si bien réglé, si bien engrené, si bien étiqueté, que le hasard n'est plus possible; encore un siècle de perfectionnement, et chacun pourra prévoir, à partir du jour de sa naissance, ce qui lui arrivera jusqu'au jour de sa mort.

THÉOPHILE GAUTIER.

RESULT OF THE APRIL COMPETITION.

French.

The prize is awarded to "Gecko," the pseudonym of S. E. Goggin, 52 Harper's Lane, Chorley, Lancashire.

First Class.—La Crevy, Baeda, Leviathan, Vacances, Edina, Blaise Pascal, Allez, Ashdown, Lily, Boniface, Agaznog, Merchiston, Marzavan, Anastasia, Braxet, Guillaume, Chêne, San Pablo, Competitor, Carpe diem, Merle, Shakespere, Chemineau, Quince, C.E.M., Sea, Coal, Wildfire, D.A.G., Fadladeen, Rustica, Mosaic, Annette, Anwyl Gariad, Camo, La poupée (Glasgow), Rutherford, La poupée (Blyth), Celia, F.M.I., Elise, Des Roches, Echo, Andromeda, Fog, Kismet, Kitty, Al fuoco, Apis, Mac, Spion Kop, Avril, Kythé, Johannes, Torridge, Nollo, E.S., Ex capite, Sesame, Thirteen, Uranie, Try back, Katrina, Camelia, Scotia, W.B.T.

Second Class.—Dock, Sculpin, Hermann, Banville, Dolorosa, Mark Tapley, Quid rides, Trial, Antigone, A.W.L., Nemo, Vigot, Paardekraal, Quidam, Doxie Dent, Osceola, C.I.V., Southlands, Maud, Colin, Véronique, Froggie, Giuseppe, Marie I., Robert, Harwin, Eunice, Dodo, Shamrock, Quo vadis, Malvoisin, Dejected, Français, Rosa, Inca, Villeroi, Still hopeful, Dei donum, N.V.N.W., Firework, Juvenile, Anthony, Hope, Jamaica, Fighting Mac, Naej, Flos, Beta, Apollo, Patience, Katherine, Quimper, Meenie, Potentissima, Emma, J'espère, Sans mérite.

Received, 10th April, too late for classification: Mont Blanc, Eigenliebe, Cissy, Cyrano de Bergerac, Leamington, Dunelm, Rioghail, Huddersfield, Polly, Sheila.

Disqualified, Rule 2: Mollie.

Report.

Considering the difficulty of the piece, the average of merit was high. The difficulty lies not only in the argument which runs through it, but in the diction. *Considérable*, *généralément*, and *individu* present great temptations for wrong translations; whilst *dès que* is used in its obsolete causal sense, and *jusque-là qu'ils nient* for the more modern *jusqu'à nier*.

French Prize Translation.

Several writers attribute to self-love, as a rule, all kinds of attachments. They assert that we appropriate to ourselves everything we love, seeking only our own pleasure and satisfaction, and putting self before all; they even go so far as to deny that he who yields his life for another prefers him to himself. In this they go too far: for if the object of our affection is dearer to us without existence than existence without the object of our affection, it is evident that it is our love, not our own individuality, which is our ruling passion; since with life we lose everything—the good which by our love we have appropriated to ourselves, as well as our actual existence. They reply that passion causes us to confound in that sacrifice our life and that of the object loved; that we think we are only abandoning a part of ourselves to preserve the other part. At least they cannot deny that what we preserve appears to us more important than what we abandon. Now from the moment we look on ourselves as the inferior part of the whole, there is a manifest preference for the object loved. The same remark can be made with regard to a man who, of his own choice, and in cold blood, dies for the sake of glory: the imaginary life which he buys at the price of his actual existence is an indisputable preference for glory, which justifies the distinction that some writers have wisely drawn between self-love and love of self.

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Key to College of Preceptors French Papers (1894-98): Aids to French Examinations. These are really useful aids to the student who is preparing for examination. The long lists in the "French notes for public examinations" strike one as at once admirable and terrible; admirable, for the student with a practical grip of French, who sees in them a *résumé* of what he has already learned from his wide, observant reading; terrible, for the student who must "cram" them, who must know all the intricacies connected with the plural of *garlic*, who must know that the feminine of *âne* is *ânesse*, and that a young donkey is *ânon*, and yet may be unable to sustain an easy French conversation or write a simple French essay. Students who have learned to speak French pretty fluently, and whose French reading is fairly extensive, should use these admirably compiled "Notes," in order to focus their knowledge for examination purposes. The lists, especially those which treat of idioms, and words liable to be confounded—for example, *aveuglement, aveuglément; amande, amende*—will prove very valuable.

La Triple Analyse—in three parts, which the author entitles *Analyse grammaticale, Analyse logique, Analyse combinée*. "It is an indisputed fact," the author tells us, "that without a knowledge of parsing it is impossible to speak or write English according to the rules of grammar." Those who agree with the author will find this little work admirable, for it is a logically-developed treatise on parsing and analysis in French and English terms. But is parsing so essential? Children who phrase their reading beautifully, who speak correctly, and write dainty little essays, without a knowledge of parsing or analysis, refute this rather extreme view. No one disputes the immense advantage of the analytical treatment of a language, when it is taken at the proper stage in a pupil's studies, and with the proviso that too much time shall not be spent upon it. The great drawback in the case of a foreign language is the immense added labour of learning new technical terms, especially when given, as in the present work, in both English and French. Hence the great question for the teacher—might not my pupils be more profitably and more practically employed in actually *using* the French language? When once the teacher has decided that his pupils need systematic drill in French parsing and analysis, then here is the very book for his purpose. After working through its sixty pages, the pupils will be mentally equipped for the struggle with that last and direst of the labours of the linguist—translation into the foreign tongue.

Preparatory French Lessons. M. Blouet claims to have prepared this little work with "great care and consideration for the immature mind;" and we can recommend it as a pleasant little book for children who have already learned to chat a little in French, and who have been through one or two of the author's delightful "Dual Readers." The plan of the book appears to us a compromise between the ancient grammar-rule-and-exercise method and the more attractive means which we now employ for the benefit of the immature mind. The most commendable points we have noticed are the interesting little "interlinear readings," the evident avoidance of sonorous definitions and polysyllabic terms, the interesting commencement—"*my* doll, *my* sister"—the conversations, and lastly, the attempt to make even the exercises resemble in some degree actual childish prattle. In fact, the author seems to realise that little children can practically grasp the facts of a language by the aid of skilfully-grouped examples, while they are still incapable of appreciating ponderously-formulated generalisations. The rules for the pronunciation of *é, è*, and *ê* are not very clear, but very few children are so unfortunate nowadays as to have to learn their French pronunciation from written rules. We can heartily recommend this little book as an attractive means of commencing grammar and exercise work.

Elementary French.—As in the *Preparatory French*, so here it is evident that M. Blouet has a firm grasp of very important principles—for example, the learning of verbs at a very early stage; the importance of reading, pronunciation, conversation; the omission of complicated explanations of the cases; and the avoidance of incomprehensible grammatical terms. The author has carried out these ideas to some extent, but he is by no means an extreme reformer. In the first pages will be found the usual description of the diæresis or *tréma*, the apostrophe, etc., and the work continues through definite article, indefinite article, partitive article, rules, vocabularies, exercises, in the old time-honoured fashion. Interesting reading lessons and conversations are interspersed, and the explanatory matter is simple and clear. At the end there is a capital synopsis of French grammar.

Intermediate French. In the preface M. Blouet decries those systems which profess to teach French in a few months. We heartily agree with him; but he makes the rash statement that "short and clear explanations of grammatical rules supply the *only* way to learn a language." By all means make rules short and clear; but do rules furnish the only way? Many of us believe that until a pupil has learned to speak and read easy French with tolerable fluency, rules are not of much use. But *autant de professeurs, autant de méthodes;* and when M. Blouet writes, "I am perfectly convinced that books written on the principles I have adopted are the *only ones* which can genuinely give students the necessary help," he only proves himself an earnest teacher in love with his own method, which is by no means a bad one. The book is clear and well arranged, and consists of well-stated rules, exercises, and vocabularies. At the end the difficult subject of translation into French is well treated.

M. Blouet's books, so clear and concise, so evidently the productions of an earnest, thoughtful teacher, deserve hearty recommendation, and will no doubt make their way in both public and private schools. They will especially appeal to those who feel the need of making the study of French easy and attractive, without revolutionary changes of method.

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There is just a danger that, under either method, the vicious features of the old *régime* may be retained, and teachers may find themselves again dispensing second-hand information about natural objects, instead of cultivating observation and inference from the objects themselves. Circular 221 of the Scotch Education Department, though addressed to Higher-Grade (Science) Schools, shows clearly the mind of the Department on this matter, when it demands "a thorough regional survey, by means of excursions, of the physical geography, flora, fauna, and historical antiquities of the district in which the school is situated;" and it may be interesting in this connection to recall the dictum of Julius Cæsar Scaliger in 1557, summing up the whole Renaissance movement towards the discipline of φύσις in one pregnant phrase—*Rerum ipsarum cognitio vera e rebus ipsis.*

Keeping this principle in mind, there can, however, be no objection to teachers who have been trained in the humanities, along the lines of λόγος rather than of φύσις, seeking to equip themselves at short notice for the new discipline; and for these such handbooks as those under review will be a welcome assistance. Whether reading books on the subject should be used in a class is another affair; and when H.M. Chief Inspector for the West of Scotland was asked at a crowded conference what textbook he would recommend, his answer, given *ex cathedra* and inspired by the Department, was, "Emphatically, *none.*"

The Chatty Object-Lesson Series admirably fulfil the purpose of teachers' handbooks in natural history, in the narrower sense of the term. Part I. deals with common domestic animals; and the next book, besides widening the range, introduces the question of function, mutual relationship, and economic value; while Part III. deals with less familiar animals, and in addition takes up plant life. The lessons are copiously illustrated by original woodcuts, blackboard sketches, and photographic reproductions; while if any fault is to be found with the letterpress, it is that its fullness presents a strong temptation to teachers to rely on the books instead of following the straight (and strait) path—*Rerum ipsarum cognitio vera e rebus ipsis.*

The Chatty Readers are intended to be companion volumes to the foregoing handbooks. They are beautifully printed, and copiously illustrated by "process" plates, blackboard sketches, and coloured plates, some of the last being exceptionally fine. A feature of the books is the attention which they direct to the functions and usefulness of animals, and the systematic way in which kindness to animals is inculcated.

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Heat, for Advanced Students. By Edwin Edser, A.R.C.S. A high standard of excellence has been reached by Mr. Edser in writing this admirable manual on Heat, for the advanced students of the Science and Art Department's examinations. It is easy to see that the writer is abreast of the times, and fully acquainted with the results of research. Indeed, almost the only fault we have to find with the book is that too much is taken for granted in reference to new work, the descriptions of which could well have been considerably extended, as, for example, the description of Mr. Tutton's apparatus for measuring the expansion of crystals. Mr. Edser will be well advised to go a little more fully into detail under this head in the further editions of the work which are, we feel sure, bound to be demanded. The kinetic theory of gases does not altogether satisfy us, as we have not yet taught ourselves to regard an atom as capable of independent existence, except in the exceptional cases of monotomic elements, like mercury, etc.; but Mr. Edser is, strictly speaking, justified in his statement, although it is hard to give up an old-established belief. The general get-up of the book is in keeping with the excellence of the exposition, so that we can strongly recommend it to all students of Heat as excellent in every respect.

M'DOUGALL'S EDUCATIONAL COMPANY.

Petite Esquisse de la Littérature Française. This little manual covers the whole wide domain from the origin of the French language down to Honoré de Balzac. We quite agree with the author that such a text-book should be written in French, for it would be rather foolish to touch the subject of French literature at all with English pupils, unless they were sufficiently advanced to read and discuss it in French. Upon the whole, we rather like this little epitome, although the author, probably through aiming at brevity, has fallen upon a dry style, not likely to arouse enthusiasm for the subject. The book has the disadvantage common to most epitomes of literature—that of giving a lifeless *simulacrum* of what is in reality instinct with life and variety. It points out to the pupil the covers and titles, but hardly gives him a peep at the contents, which would interest him so much. The work would be greatly brightened by the addition of illustrative passages from the more

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PITT PRESS SERIES.

Remi en Angleterre. This interesting little modern French text is a sequel to *Remi et ses Amis*, both being taken from Hector Malot's *Sans Famille*. The introduction supplies a few facts respecting the author, and an outline of the career of his hero Remi up to the point at which the present selection commences. The notes are simple, practical, helpful. On page 147, the description given of a French *juge de paix* would apply rather to a *juge d'instruction*. There is a useful appendix on the French subjunctive, and a good vocabulary. The importance of reading quite modern French—living authors for living languages—is now acknowledged; and the present story is especially valuable on account of its English locale, its bright and varied incidents, and the frequency of conversational phrases. It deserves to be widely used.

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CORRESPONDENCE.

TO THE EDITOR OF "THE PRACTICAL TEACHER."

SIR,—I appeal to your sense of fairness in asking you to print this rejoinder to your reviewer's hostile criticism of our arithmetic book. I shall not waste your space in refuting all the points he animadverts upon, as some of them at least may safely be left to answer themselves, but I must deal with one or two subjects which are not of special but of general interest. Your reviewer says correctly that the decimalisation of £ s. d. to three places was known before we were born; but we discovered nearly forty years ago, and published in 1871, a method for writing down, *currente calamo*, the fourth and all the succeeding places of the fraction. How important that is may be seen from the following examples:—Find 1000 × 3s. 11½d. To three places the decimal of 3s. 11½d. is £·172, whence the resulting answer is £172. The full fraction is £·172916, whence the answer is £172, 18s. 4d.—a very appreciable error. Or take 100,000 lbs. of raw cotton at 5¾d. per lb. At three places the decimal is £·023, and the answer comes out £2300. The full fraction is £·023916, yielding as answer £2391, 13s. 4d.—an error of £91, 13s. 4d.! Naturally the decimalisation to three places was found useless. Our method, if universally adopted, would confer on the country all the benefits of decimal money without our forfeiting the notable advantages derived from our present coinage; in the counting-houses we shall dispense with those primitive ready reckoners, which are unknown on the Continent; and when we are rid of the incubus of the examination craze, our school arithmetics will be reduced in bulk by at least one-third, and be equally efficient. This problem of decimalising £ s. d. at sight lay unsolved before the country for some two centuries, and we have had the good fortune to light upon the solution. *Suum cuique* is surely mere common honesty, and your reviewer, instead of being wroth with us for claiming our own, ought to commend us. In no walk of literature is piracy practised as unblushingly as in the compilation of school books. One member of that ilk boasted to me that he had produced several "paying" books with mere scissors and paste. I put it to you—does not such appropriation deserve public reproof? As for the truth of our allegation that such copying from us has occurred, let the following instance vouch:—When first we discovered our method of decimalising £ s. d., we gave a lengthy and cumbrous demonstration of it, but gradually we reduced and condensed it into this single line: $\frac{24)\cdot005}{£\cdot001\frac{1}{24}}$. This we published in 1871. Fifteen years afterwards another writer published: 1 farthing = $1\frac{1}{24}$ mil = £·001$\frac{1}{24}$, and accompanied this by a rule in large type, which contains a grave error that he could not possibly have committed had he worked at the solution himself instead of merely appropriating it. The instances where people have ploughed with our heifer are too numerous to be quoted here, yet we hold with Mr. Suffield that "what is worth quoting is worth acknowledging." Your reviewer has drawn our attention to some slips in calculation: for this we beg to thank him. We will examine them; and if our critic is right, we will in the next edition make the necessary alterations, with due acknowledgment.—I am, sir, yours, etc.,

A. SONNENSCHEIN,

Joint Author of Sonnenschein and Nesbitt's "Science and Art of Arithmetic."

WANDSWORTH, *April 1900.*

[Mr. Sonnenschein seems to miss my point. I do not question his claim to the discovery of the accurate decimalisation of money at sight, nor do I dream of denying that, if this claim can be substantiated, and I have no reason to doubt that it can, the discovery is of such importance that, in common honesty, authors who use it should acknowledge their obligations. I asserted in my review that the examples which were adduced in the unfortunate preface to the *New Science and Art of Arithmetic* to prove plagiarism on the part of certain distinguished writers of text-books in reality proved no such thing, seeing that the first did not depend at all upon Mr. Sonnenschein's discovery, but only upon the method of three-place decimalisation, which was known long ago. I see no reason in the letter you send me to induce me to alter this opinion. It is surely possible that two writers may independently adopt a similar procedure in such a subject as arithmetic. Our authors, for instance, appear to have calculated the table of recurring decimals to which I referred quite in ignorance of the fact that Burckhardt and Shanks had both done it before them, the former at least before their first edition, and both more accurately than Mr. Sonnenschein and his partner. YOUR REVIEWER.]

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